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HEALTH ASPECTS OF PESTICIDES ABSTRACT BULLETIN is a monthly publication of the Technical Services Division of the Environmental Protection Agency.

The purpose of this publication is to foster current awareness of the major worldwide literature pertaining to the effects of pesticides on humans. The publication represents a monthly review of more than 1150 domestic and foreign journals. Subjects and authors of abstracted articles are cross-referenced in an annual index issue. Reprint requests should be directed to the author of the complete article.

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73-0257. Adkisson, P. L. (Dept. of Entomol., Texas A&M Univ., College Station, TX). **Objective uses of insecticides in agriculture.** *In: Agricultural Chemicals–Harmony or Discord for Food, People, and the Environment. J. E. Swift, ed., Univ. Calif., Div. Agr. Sci., 1971, pp. 43-51.*

Chemical insecticides used before World War II neither greatly disrupted the ecology nor had much insecticidal effect. The introduction of organochlorines brought about spectacular increases in crop yields. However, problems have developed, including ecological ones, through prolonged use of pesticides. Insect resistance and the disturbed insect ecology in certain areas has led to the use of other chemicals which seem to have an effect equivalent to or worse than the initial pesticides. In Texas a number of programs have been successful in drastically reducing pest populations without the use of insecticides. The lack of trained pest management specialists to provide technical assistance to producers retards the widespread use of these successful approaches.

73-0258. Kahn, E. (Bureau of Occup. Health and Environ. Epidemiol., Calif. Dept. of Pub. Health, Berkeley, CA). **Public health aspects of environmental contamination with mercury.** *In: Agricultural Chemicals–Harmony or Discord for Food, People, and the Environment. J. E. Swift, ed., Univ. Calif., Div. Agr. Sci., 1971, pp. 85-90.* (13 references)

Mercury contamination of the environment is related to the use of organic mercurials as agricultural fungicides. The resulting methyl mercury presents three hazards: poisoning of birds which eat mercury-treated grain; translocation of mercury into food grown from treated seed; and use of treated grain as food by hungry and uneducated people. Swedish naturalists have attributed a decline in populations of certain bird species to the presence of methyl mercury on the grain they eat. When mercury in any form is dumped into waterways, it is methylated by microorganisms and enters the aquatic food chain. Methyl mercury is easily absorbed from the gastro-intestinal tract and adversely affects the central nervous system and tissues of the fetus; brain damage is caused by destruction of the brain cells. The government-set tolerance level of 0.5 ppm for fish is practically worthless because it does not distinguish between safe and dangerous fish and does not take into account the amount of fish a person consumes or the individual susceptibility.

73-0259. Huffaker, C. B. (Dept. of Entomol. and Parasitol., Univ. of Calif., Berkeley, CA). **The ecology of pesticide interference with insect populations.** *In: Agricultural Chemicals–Harmony or Discord for Food, People, and the Environment. J. E. Swift, ed., Univ. Calif., Div. Agr. Sci., 1971, pp. 92-104.* (23 references)

Insecticides have been in greater demand after adversely affecting populations of beneficial insects and stimulating pest reproduction and development of resistance. An integrated pest control program has been established for citrus in Israel, for cotton in Peru, for oil palms in Malaysia, and for a number of pests in glasshouses in Europe. The Project in Biological Control (U.S. International Biological Program) is currently organizing a national program to solve problems through integrated control. Changes in pest-control philosophy, strategy and tactics, public attitudes, marketing, and advising systems will be required.

73-0260. Wierenga, M. E. (Western Agr. Chem. Ass., San Jose, CA). **What is being done by the pesticide chemical industry.** *In: Agricultural Chemicals–Harmony or Discord for Food, People, and the Environment. J. E. Swift, ed., Univ. Calif., Div. Agr. Sci., 1971, pp. 130-132.*

After industry formulates a chemical for use as a pesticide, several acute, oral, dermal, chronic, subacute, and subdermal toxicity tests are conducted on a variety of animals through three generations. The metabolites of the new chemical are studied on fish, birds, wildlife, aquatic organisms, plants, soil, and water. This process takes about 10 years and costs about eight million dollars. Before a new manufacturing plant is built, several studies are made on the possibilities of environmental pollution. Chemical industries support new pesticide control methods and try to provide labels that are clear, comprehensive, and informative. They also provide information and recommendations on acceptable methods of cleaning containers and disposing of residues. A network of safety teams from nine major members of the National Agricultural Chemicals Association provides a 24-hr manned accident service throughout the U.S. The industry has made an educational movie entitled "Handle With Care" that trucking companies use for training purposes. The industry also supports the licensing or registration of pesticide salesmen.

73-0261. Fielder, J. W. (Calif. Dept. of Agr., Sacramento, CA). **What is being done by the California Department of Agriculture.** *In: Agricultural Chemicals–Harmony or Discord for Food, People, and the Environment. J. E. Swift, ed., Univ. Calif., Div. Agr. Sci., 1971, pp. 133-136.*

The California Department of Agriculture is responsible for the control and regulation of agricultural chemicals in the state. The basic policy is to reduce the use of agricultural chemicals to the essential need. A Pesticide Advisory Committee handles problems. In addition to setting up registration procedures, the Department licenses pest control applicators, dealers, and pilots. A system in which almost every county has a representative of the Department of Agriculture has permitted extensive reporting of agricultural chemical usage. Such a report shows pesticide use, amounts, target pests, and locations. For worker safety, time intervals

are established between application and entry of a worker into a field.

73-0262. Bayley, N. D. (Science and Education, U.S. Dept. of Agr., Washington, DC). **What is being done by the Federal Government.** *In: Agricultural Chemicals–Harmony or Discord for Food, People, and the Environment. J. E. Swift, ed., Univ. Calif., Div. Agr. Sci., 1971, pp. 136-138.*

In an effort to deal with problems created by pesticide use, the Environmental Protection Agency was formed by the Federal Government. Research, monitoring, standard-setting, and enforcement activities previously scattered throughout several departments and agencies were combined. A Working Group on Pesticides was established in 1970, under the aegis of the Council on Environmental Quality, to develop program and policy proposals and to provide daily coordination on pesticides and pest control. The Group has prepared an acceptable national policy on pesticides and cosponsored a national conference on pesticide disposal, as well as developing reference documents on the subject and issuing a "Summary of Interim Guidelines for the Disposal of Surplus or Waste Pesticides and Pesticide Containers." Agricultural scouts will determine types and quantities of pesticides to be used in fields in pilot-scale studies on tobacco in North Carolina and cotton in Arizona.

73-0263. Mrak, E. M. (University of California, Davis, CA). **Summation: the benefit/risk factor in pesticide uses.** *In: Agricultural Chemicals–Harmony or Discord for Food, People, and the Environment. J. E. Swift, ed., Univ. Calif., Div. Agr. Sci., 1971, pp. 149-150.*

At the symposium on agricultural chemicals, sponsored by the University of California Division of Agricultural Sciences, diverse views were expressed on the benefits and risks of pesticides. Some of the speakers placed particular emphasis on one aspect with little concern for others. A balanced view would hold that wildlife cannot be protected at the expense of flora and vice versa; a zero cholinesterase effect is an unreasonable goal; and application of chemicals without regard for natural enemies and other environmental considerations is poor judgment. Reasonable judgment and teamwork are needed to provide answers to the many questions concerning the use of these chemicals.

73-0264. Shubert, J. (Grad. School of Pub. Health, Univ. of Pittsburgh, Pittsburgh, PA). **A program to abolish harmful chemicals.** *Ambio 1(3): 70-89; 1972.* (57 references)

The genetic risks, population exposure, fetal susceptibilities, and synergistic effects of chemicals in the environment are reviewed and proposals made for dealing with chemicals that are potentially toxic, teratogenic, mutagenic, or carcinogenic. Substances such as pesticides, which serve a necessary function and have been used for many years, require routine testing. Mutagenic and/or toxic chemicals should be tested in the outlined program which includes long-term exposure tests. Legislation and strict penalties are necessary to safeguard public health. Long-range genetics and toxicity testing should be done by regional government operated laboratories, directed by representatives of government, industry, and the public, and financed by industry and government. Support of education and research in methodology in mutagenic phenomena is also needed.

73-0265. Jensen, S. (Nat. Environ. Protection Board, Special Analytical Lab., Sweden). **The PCB story.** *Ambio 1(4): 123-131; 1972.* (17 references)

The discovery of PCBs as a pollutant occurred during analysis of organochlorines in human fat tissue at the Univ. of Stockholm. Up to 14 previously not described peaks were found in the gas chromatograms. Through a series of analyses on wildlife from different regions and from different years (museum samples), it was determined that the substances did not occur naturally, were concentrated in the food chain, and were not metabolites of organochlorine insecticides. Through GC-MS analysis the presence of varying numbers of chlorine atoms was established and molecular weights of the parent hydrocarbons derived, which suggested a biphenyl parent molecule. Identification of the unknown substances took two years, lagging behind contamination of the environment. PCBs are more persistent than DDT and can be destroyed in existing industrial facilities by burning in oil at 1,400°C with a deficiency of oxygen. Toxic symptoms of PCB poisoning are fatty degeneration of the liver, stimulation of microsomal enzymes, chloracne-like skin eruptions, pigmentation, visual disturbances, abdominal pain, and fatigue. With no treatment methods available, deaths have occurred. PCB blood levels ranged from 7 to 14 ng/g in Swedes and from 5 to 35 ng/g in Japanese. In Sweden use, import, manufacture, and sale of PCBs are prohibited without permission from authorities.

73-0266. Morris, R. D. (Brock Univ., St. Catharines, Ontario, Canada). **Biocides and mammals.** *Blue Jay 29(3): 136-140; 1971.* (47 references)

DDT and other chlorinated hydrocarbons should be labeled biocides rather than insecticides since their activity is not selective. They block the synthesis or operation of enzymes necessary for normal functioning of the nervous and muscular systems and induce the synthesis of some enzymes responsible for maintaining the delicate balance of steroid hormones. Chlorinated hydrocarbons concentrated in fatty tissue can be mobilized in periods of stress, such as cold or starvation, and during nursing. Adverse effects on reproductive biology have been demonstrated in offspring nursed by

animals exposed to low residues in the field. The major kinds of effects on wildlife expected are outlined. The following recommendations are made to the Canadian Ministers of Health and Welfare and of Agriculture: existing DDT legislation should be extended to aldrin, dieldrin, endrin, heptachlor, and toxaphene; the manufacture, sale, and application procedures should be under strict government control; a cash incentive program to encourage farmers to keep belts of natural vegetation adjacent to crops should be developed; a resolution should be presented to the U.N. encouraging a ban on all uncontrolled sale or use of organochlorines.

73-0267. Borlaug, N. E. (Int. Center for Maize and Wheat Improvement, Mexico City, Mexico). **Statement on agricultural chemicals.** *Clin. Toxicol. 5(2): 295-297; 1972.*

An editorial recommends putting the problem of agricultural chemicals into proper perspective. Banning DDT in this country will cause other countries, one by one, to do the same with disastrous effects on food production. Once the environmentalists have effected a ban on DDT, they will move to remove all other pesticides. DDT has been extremely vital in controlling malaria and in increasing food production. Evidence of its effect on wildlife is unproven and, in any case, man must come first.

73-0268. Rodgers, Jr., W. H. (Univ. of Washington, Seattle, WA). **The persistent problem of the persistent pesticides: a lesson in environmental law.** *Columbia Law Rev. 70(4): 567-611; 1970.* (267 references)

An interpretation and criticism of the Mrak Commission's recommendations concerning the relationship of pesticides to environmental health is presented. The Commission's view that the pesticide registration process should not remain the responsibility of the USDA alone has the greatest long range implications. The proposed agreement between the USDA, the Dept. of Health, Education and Welfare, and the Dept. of the Interior should include clearly articulated legal responsibilities and powers of veto. More specific requirements than were recommended are needed in the areas of sale, use, and disposal of pesticides. Requiring use permits for pesticides would decrease indiscriminate applications. No modifications in the Delaney amendment which forbids the use of carcinogens should be allowed. The Commission's assertion that the U.S. government should assume leadership in international efforts to promote safe effective use of pesticides deserves emphasis.

73-0269. Metcalf, R. L. (Dept. of Zool., Univ. of Illinois, Urbana, IL). **DDT substitutes.** *Environ. Contr. 3(1): 25-59; 1972.* (111 references)

Once considered an almost perfect insecticide, DDT will be declining in use after 25 yr of unprecedented triumphs in disease control and agricultural production. Chemical control will continue to be the chief means of protection of crops and human health from insect attack, but insect resistance and environmental pollution have promoted the search for more specific, less persistent substitutes. Of the DDT analogs investigated, methoxychlor is one of the safest and is biodegradable, though slowly. A number of asymmetric DDT analogs also look promising and can be made biodegradable. Analogs designed to be insensitive to attack by DDTase are effective against DDT-resistant insects. Lindane and the cyclodienes, some of the first substitutes for DDT, have similar drawbacks. Carbamates and organophosphates are less persistent although more acutely toxic. No single new substitute will be as cheap and universally effective as DDT.

73-0270. Panel on Hazardous Trace Substances. (Nat. Inst. of Environ. Health Sci., Research Triangle Park, NC 27709). **Polychlorinated biphenyls–envionmental impact.** *Environ. Res. 5(3): 249-362; 1972.* (244 references)

A review of the properties, environmental occurrence, and biological effects of polychlorinated biphenyls (PCB) is presented. Interest in PCBs as environmental pollutants has grown only since a series of incidents, including large-scale contamination of cooking oil in Japan in 1968, illustrated their potential hazard. The probable structure of principal isomers in commercial mixtures has been resolved, but there is still a need to standardize the labeling of peaks in chromatograms of environmental samples. Cumulative sales are estimated to be 5×10^5 tons in the U.S. Rough estimates of the fate of PCBs suggest that 20% are still in service, 5% have been discharged by vaporization, 10 to 15% have been dumped into fresh or coastal waters, and 55% have been dumped or incinerated. Eventual distribution is probably similar to that of DDT although little is known other than the fact that high levels are found around industrialized areas. Acute toxicity is relatively low in birds and mammals, but long-term low levels have produced enlargement of the liver and induction of hepatic microsomal enzymes, estrogenic effects, and porphyria. Contaminants have been responsible for fetotoxic effects and perhaps the chloracne observed in PCB poisoning. PCBs are moderately toxic to fish and inhibit growth of phytoplankton at 10 to 100 ppb. There is a need to develop general systems models to describe the environmental transport of PCBs and other chemicals; to develop a system for identifying potentially hazardous pollutants and testing their environmental effects before they are released in large quantities; and to better correlate the toxicity of chemicals to test animals with their effects on animal and human populations.

73-0271. Goldberg, L. (Inst. of Exp. Pathol. and Toxicol., Albany Med. College of Union Univ., Albany, NY 12208). **Safety of environmental chemicals–the**

need and the challenge. *Food Cosmet. Toxicol. 10(4): 523-529; 1972.*

The safety evaluation of chemicals such as food additives and pesticides has remained rather primitive in the light of new scientific techniques. A less regimented, more reasonable approach is necessary to explore the problems which each compound poses: definition of the actual compound, whether it is a main component, trace impurity, or reaction product; accurate assessment of levels of exposure; delineation of the toxic potential, particularly with respect to low-dose, long-term exposure; determination of disposition and transformation of the compound; and extrapolation of animal data to man through suitable animal models, controlled human exposure, and epidemiological studies. A feasible approach to safeguarding the industry's competitive position while pursuing the more expensive but necessary improvements in research and development seems to be phased introduction of new compounds. In this a product is licensed for limited applications while safety and efficacy studies continue and the cost is shared by industrial users of the compound.

73-0272. Kagan, Yu. S.; Sasinovich, L. M.; Ovseyenko, G. I. (All-Union Res. Inst. for Hyg. and Toxicol. of Pestic., Polymers, and Plastics, Kiev, USSR). **Sposob oriyentirovochnogo rascheta gigiyenicheskikh normativov pestitsidov v produktakh pitaniya s pomoshchyu korrelyatsionnogo analiza pokazateley toksichnosti i kumulyatsii. [Approximate estimation of hygienic standard levels of pesticides in food products by means of correlation analysis of toxicity and cumulation indices.]** *Gig. Sanit. 37(7): 44-46; 1972.* (6 references) (Russian)

To evaluate the possibility of using a single item of toxicologic information in predicting the approximate permissible residue level of a pesticide in foods, a statistical analysis was performed. Multifactorial correlations were calculated between the established permissible residue level and the acute and chronic toxicity values or their ratios. Linear and polynomial regression equations were developed and can be used to predict the acceptable residue level approximately within a factor of 5. Naturally, these equations cannot serve as substitutes for a full toxicity testing program, nor are they applicable to pesticides whose residues are limited by organoleptic rather than toxicologic considerations.

73-0273. Ignat'yev, A. D.; Shabliy, V. Ya. (Author address not given). **Bol'she vzaimodeystviya mezhdu sanitarnoy i veterinarnoy sluzhboy v dele kontrolya za pravil'nym primeneniyem pestitsidov. [Need for more cooperation between hygienic and veterinary services in controlling the proper use of pesticides.]** *Gig. Sanit. 37(8): 110-111; 1972.* (Russian)

The need for more cooperation between hygienic and veterinary services in controlling the use of pesticides and quality of food is emphasized. Regulations concerning the use and processing of pesticide-contaminated raw products are insufficient. The consumption of meat from emergency-slaughtered animals may be conditionally permitted when the meat is boiled, but not when roasted or broiled. Broths from such meat and any products containing pesticide residues in excess of the maximum allowable concentration are unsuitable for consumption. Animals fed on contaminated feed may yield products unfit for consumption without showing clinical symptoms of poisoning. Only laboratory control can detect these. Though pesticide residues in honey have occurred repeatedly, sanitary and epidemiological stations conduct no routine control for the detection of such contaminants.

73-0274. Deichmann, W. B. (Ind. Med. and Surgery, P.O. Box 7151, Ft. Lauderdale, FL 33304). **Research, DDT and cancer.** *Ind. Med. Surg. 41(8): 15-18; 1972.* (10 references)

A new approach is needed to replace the evaluation of carcinogens based on tests which use inappropriate animals and unrealistically high levels of compound. Animals should be chosen on the basis of metabolic and toxicologic similarities to man for the compound in question to indicate man's reaction. DDT has been labeled carcinogenic on the basis of data from rodents. The present low incidence of hepatic cancer in man in highly industrial countries indicates that man may respond more like chickens, dogs, cats, and monkeys. A more generous support of basic research would probably yield an abundance of information not uncovered in applied research.

73-0275. Johnson, N. E. (Southern Forestry Res., Weyerhaeuser Co., Hot Springs, AR). **Pesticide usage in forestry.** *J. Forestry 70(9): 546-548; 1972.* (12 references)

The forest manager must use some pesticides in order to achieve a satisfactory production rate. He can minimize usage by only spraying when there is a proven advantage; not spraying in wilderness or recreation areas; controlling mosquitos only when they carry disease; and not attempting to control bark beetle in decadent and distressed timber. An equitable solution to the problem of uneven losses incurred by different owners after a decision not to spray would be redistribution of money that would have been spent for spraying, based on the losses. More emphasis on mortality prediction and salvage and on nonpesticidal means of control are needed.

73-0276. Irving, Jr., G. W. (Life Sci. Res. Office, Fed. of Amer. Soc. for Exp. Biology, Bethesda, MD). **The role and future of pesticides in maintaining food supply.** *J. Wash. Acad. Sci. 62(3): 240-247; 1972.* (9 references)

The expected population growth in the next 30 yr and the small amount of reserve land available make it imperative that agriculture maintain and improve its efficiency to provide the needed food. The monoculture system, coupled with control of pests that thrive under such a system, is the most efficient means of food production but presents environmental questions involved with pesticides and alternative controls. Quarantine has been effective in reducing the need for pesticides to control imported pests, but inspectors will be overtaxed in the years ahead. Eradication has been successful in some cases, but the process of "living with" a pest is still the general rule. Additional tools for improving the farmer's competitive position in this process include: resistant crop varieties; improved cultural practices; the use of parasites, predators, and pathogens as biological agents; development of genetic defects such as sterility; physical devices; and attractants and hormonal insecticides. Prudent use of chemicals will continue to be important for the next few decades since alternatives require time.

73-0277. Mel'nikov, N. N. (All-Union Research Inst. of Chemical Plant Protection Products, USSR). **O perspektivnom assortimente pestitsidov. [On the selection of promising pesticides.]** *Khim. Sel. Khoz. 10(4): 268-274; 1972.* (40 references) (Russian)

A great variety of pesticides are listed and characterized according to their toxicity, persistence, and use. Moderate toxicity to warm-blooded animals, fish, and planktons and rapid metabolism into more or less harmless products in the organism and the soil are sought in pesticides. The LD50 doses in rat and lethal concentrations in fish are listed for several pesticides. The variations in the toxicity of the same product to warm-blooded animals and fish are due to differences in the mode of action. Most organochlorine and arsenic compounds persist more than 18 months in the soil. DDT is destroyed relatively rapidly by certain microorganisms under anaerobic conditions. The persistence of chloroaminotriazines, picloram, and urea derivatives is about 18 months while that of benzoic acid derivatives and carbamates is 12 months. Pesticides of different classes should be used alternately to prevent accumulation in the ecosystem. Organophosphorus pesticides metabolize into relatively harmless products in warm-blooded animals although their esters and amides do not. A high rate of metabolism of carbamates, especially of esters and salts of thio- and dithiocarbamic acids, was determined. Many urea derived compounds, except for monuron and diuron, decompose during the growing period. Carbaryl, aldicarb, phthalophos (phosmet) Butyphos (DEF), molinate, triallate, Eptam (EPTC), polycarbazine, hydroxylamine derivatives, nitrofen, benomyl, aryloxyacetic acid and 2-methoxy-3,6-dichlorobenzoic acid (dicamba) derived compounds are among the most promising pesticides from the viewpoint of toxicity and persistence.

73-0278. Quinby, G. E. (Oak Ridge National Lab., Oak Ridge, TN). **Polychlorobiphenyls (PCBs) and related chlorophenyls: effects on health and environment. I. Bibliography–1881-1971.** *(Distributed by National Technical Information Service PB-209 944), 1972. 140 p.* (870 references)

This bibliography of literature on the health and environmental aspects of polychlorinated biphenyls (PCBs) was compiled for a state-of-the-art review and was published first because of the urgent need for information sources in the PCB field. A period of 90 yr has been surveyed although interest in these chemicals as environmental pollutants has only been demonstrated by an expanding literature since 1970. In addition to the bibliography, a simple author index and a permuted title index are included.

73-0279. Gochfeld, M. (Columbia Univ. Sch. of Pub. Health and Admin. Med., New York, NY 10032). **Pesticides and the nursing mother.** *Pediatrics 50(1): 169-170; 1972.* (7 references)

In a Letter-to-the-Editor, the fact that breast-fed infants consume more DDT-like compounds than the average U.S. adult is discussed. This fact is used by the author to relieve the guilt of mothers who have stopped nursing because of lack of supply or discomfort. Little is known of the metabolism, distribution, and toxicity of these compounds in the infant. Although the use of DDT has been halted and eventually human exposure may be diminished, studies in people of all ages are necessary to elucidate these areas of concern.

73-0280. Caldwell, R. L. (Dept. of Plant Pathol. Univ. of Arizona, Tucson, AZ). **Toxic compounds...in the agricultural environment: lead, mercury.** *Prog. Agr. Ariz. 23(6): 4-5; 1971.*

Concern over pollution by lead and mercury has recently increased. Lead-containing chemicals, including pesticides, account for less than 0.04% of the lead used in the U.S., but fields formerly sprayed with lead-containing pesticides can still produce high levels in plants. About 4.5% of the mercury used is associated with agricultural chemicals. Seed dressings containing mercury have caused poisoning through accidental consumption of seed; only two special situations have been reported in which mercury was translocated from the seed to the germinated plant. Some of the seed treatments have been suspended. A 2000 to 1 safety factor would be many times lower than the naturally occurring level of mercury. The Food and Drug Administration has established a zero tolerance in all food although a guideline of 0.5 ppm has been designated for fish. Since there are only small differences between natural and toxic levels of lead and mercury, man should not contribute more of these elements to the environment.

73-0281. Fertilizers and Agricultural Chemicals Sub-Council. (Nat. Ind. Pollution Control Council, Washington, DC 20230). **Sub-Council Report.** *U.S. Government Printing Office, Washington, 1971. pp. 1-40.* (10 references)

In this progress report the fertilizer and pesticide industries are discussed regarding uses and classification of products, toxicity and persistence of members of each classification, problems within the industry such as expensive toxicity studies, and recommendations for the future. Emphasis is placed on the need for a balanced view of the benefits and risks of pesticide use. To improve the approaches to problems associated with pesticide use the Fertilizer and Agricultural Chemicals Sub-Council recommends: public education at all ages on the position of chemicals in agriculture and public health; applicator education on the concept of integrated control; restrictions to insure occupational safety; nationally uniform regulations; improvement of review of scientific data; an experimental permit program; development of better containers and of new disposal processes and regulations; continuation and extension of monitoring programs; cooperative government/industry research programs on pest control problems; and realistic water quality standards, updated as technology progresses.

73-0282. Robinson, R. G. (Dunedin, New Zealand). **The environment and New Zealand.** *World Med. J. 19(1): 16-17; 1972.* (3 references)

Enormous changes in the landscape in a short period of time have brought a number of pollution problems to New Zealand. Pesticides which play an important role in the country have evidently been used carefully. Although they are toxic, few fatalities have been attributed to their use. A major concern with pesticides is the potential threat of residues to export industries on which the economy depends. The Agricultural Chemicals Board, established in 1959, registers and withdraws chemicals used in agriculture.

73-0283. Yamaguchi, I.; Takagi, K.; Misato, T. (Inst. of Phys. and Chem. Res., Wako, Saitama Prefect., Japan). **The sites for degradation of Blasticidin S.** *Agr. Biol. Chem. 36(10): 1719-1727; 1972.* (6 references)

Blasticidin S, a fungicide, was degraded slowly within the rice plant, efficiently by sunlight, and also by soil microorganisms. The biological activity of Blasticidin S sprayed on rice plants decreased more rapidly when exposed to direct sunlight or when plants were in younger stages. The antibiotic translocated from the surface only when the test plant surface was pre-treated with carborundum or organic solvent. Considerable translocation was observed when plants were grown in a medium containing Blasticidin S. A small amount of cytomycin and a trace of deaminohydroxyblasticidin S were observed as metabolites. When 20 ppm of labeled Blasticidin S was sprayed on the ears of grain, unpolished rice contained radioactive compounds less than 0.01 ppm calculated as Blasticidin S; washing removed most of the radioactivity. Blasticidin S was firmly adsorbed on the soil surface and several soil isolates while stock microorganisms caused its inactivation.

73-0284. Ide, A.; Niki, Y.; Sakamoto, F.; Watanabe, H. (Lab. of Pestic. Chem., Fac. of Agr., Ehime Univ., Matsuyama, Japan). **Decomposition of pentachlorophenol in paddy soil.** *Agr. Biol. Chem. 36(11): 1937-1944; 1972.* (14 references)

The herbicide, pentachlorophenol, decomposes within a few weeks after its application in rice fields. A reductive dechlorination was revealed as one of its decomposition pathways, in which some microorganisms play a dominant role and other soil chemical factors in a reduced condition are of relatively little importance. The stable decomposition products found in the paddy soil were 2,3,4,5-, 2,3,5,6- and 2,3,4,6-tetrachlorophenol; 2,4,5- and 2,3,5-trichlorophenol; 3,4- and 3,5-dichlorophenol; and 3-chlorophenol. (Author abstract by permission)

73-0285. Phillips, J. H. (Hopkins Marine Station of Stanford Univ., Pacific Grove, CA). **Effect of pesticide chemicals on marine organisms.** *In: Agricultural Chemicals–Harmony or Discord for Food, People, and the Environment. J. E. Swift, ed., Univ. Calif., Div. Agr. Sci., 1971, pp. 68-79.*

The presence of DDT and mercury in fishery products in recent years has caused concern over the use of organic pesticides. In several cases pesticide residue levels in marine organisms have been correlated with abnormalities and declines in marine populations. Studies of fish in the Monterey Bay area have shown a range of 0.022-66.0 ppm of DDT derivatives in the liver. Levels of DDT derivatives in the blubber of 40 sea lions ranged from 4,000 to 41 ppm with the median between 500 and 1,000 ppm; the average DDT derivatives in the brain ranged from 10-15 ppm. Water samples were taken below the surface along the West Coast for simultaneous measurements of DDT derivatives in the water and in the phytoplankton. Only 10% of the DDT derivatives were associated with the phytoplankton; the other 90% present a possible burden to benthic organisms. Another study measuring the burden in marine sediments in Monterey Bay indicates an input of DDT by water runoff from the Salinas Valley. Questions raised during the discussion period dealt with the significance of low-level pollution by agricultural chemicals and the interpretation of epidemiologic information.

73-0286. Anonymous. **TCDD residues disappear.** *Agr. Res. 21(4): 6; 1972.*

The contaminant, 2,4,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD), present in 2,4,5-T up until 1969, was not detected in three ft core samples taken in 1970 from experimental plots which had been sprayed with massive doses of the herbicide over the preceeding eight yr. Eagles, which are representative of the top of the food chain, contained no residues above 0.05 ppm, the limit of detection. Dissipation from the soil may have been the result of microbial degradation, photodecomposition, volatility, and/or wind erosion. The absence of TCDD residues in eagle tissue suggests that residues from past applications of 2,4,5-T were not available to enter the food chain.

73-0287. Anonymous. **Testing desert herbicide residues.** *Agr. Res. 21(5): 16; 1972.*

Trifluralin, prometryne, atrazine, and diuron were incorporated in desert cropland soils at Yuma and Mesa, Arizona. The schedule of application resulted in fallow periods following herbicide application at 24, 18, 12, 6, and 0 mo before crops were planted. Under the dry conditions of Arizona, all the herbicides caused reductions in stands of one or more crops for extended periods. Rainfall was apparently not sufficient to support normal herbicide degradation.

73-0288. Ulfstrand, S.; Soedergren, A. (Dept. of Anim. Ecol., Univ. of Lund, Sweden). **Organochlorine residues in East African birds.** *Ambio 1(4): 150-151; 1972.* (20 references)

Low levels of *p,p'*-DDE, *p,p'*-DDT, and/or lindane were found in 23 of the 29 birds examined from an arid savannah in Tanzania, E. Africa. Aldrin, dieldrin, and polychlorinated biphenyls were not detected. No consistent difference was seen between herbivorous and carnivorous birds. The area tested was probably representative of vast areas of semi-arid tropical Africa, and it is possible that many tropical migrants are not exposed to very serious residue levels during their stay in Africa. The birds probably accumulate the major part of these

organochlorine residues observed after migration between breeding grounds and winter quarters.

73-0289. Prospero, J. M.; Seba, D. B. (Rosentiel Sch. of Marine and Atmospheric Sci., Miami, FL 33149). **Some additional measurements of pesticides in the lower atmosphere of the northern equatorial Atlantic Ocean.** *Atmos. Environ. 6(5): 363-364; 1972.* (7 references)

Average concentrations of *p,p'*-DDT and *p,p'*-DDE in air collected from the trade winds at Barbados, West Indies, during the period of maximum Saharan dust transport were 0.057 pg/m^3 and 0.009 pg/m^3, respectively. These values were comparable in magnitude to those reported earlier for the period of minimum dust transport. The dust loads were about 100 times greater than those reported earlier. Concentrations of the pesticides were higher at times of low dust loads than at times of high dust loads. This is further evidence that the pesticides are not associated with African dust, but come from northern latitudes. Calculation of a lower limit on the quantity of DDT and DDE transported by the winds through the longitude of Barbados gave an annual mass flux of 200 kg/yr. A high probability of this being deposited in the ocean is expected since the estimated residence time in the lower troposphere was 1 to 2 wk.

73-0290. Quraishi, M. S. (Dept. of Entomol., N. Dakota State Univ., Fargo, ND). **Edaphic and water relationships of aldicarb and its metabolites.** *Can. Entomol. 104(3): 1191-1196; 1972.* (15 references)

Aldicarb and its metabolites did not persist more than 13 wk in soil (clay loam) treated in the laboratory with 0.5 and 2.0 mg/100 g. Although the experiment with 5 mg/100 g could not be completed, only 1/20 of the original dose remained after 11 wk. Most of the aldicarb was eluted from treated soil columns with 15 ml of water although measurable amounts were still leaching in later fractions. In field water high concentrations of the compound took about 46 wk to dissipate. Three samples of sugarbeet roots taken from treated plants held at 40° F for less than 2 wk and washed, cut, and frozen, contained 0.05, 0.05, and 0.2 ppm of the insecticide and its metabolites. Less than 0.05 ppm was found in potatoes harvested from treated fields.

73-0291. Weber, J. B.; Weed, S. B.; Sheets, T. J. (North Carolina State Univ., Raleigh, NC). **Pesticides. How they move and react in the soil.** *Crops Soils 25(1): 14-17; 1972.*

The physical and chemical properties of pesticides and properties of the soil and water, along with a number of outside forces, influence the speed of breakdown of the chemicals after application. Cationic chemicals may be tied up in soil, unavailable as pesticides and for degradation. Anionic chemicals are more susceptible to leaching since they do not react with the soil in their ionized form. Volatilization and photodecomposition affect a number of pesticides. The dinitroaniline herbicides and the organochlorines do not vaporize and have very low solubility which makes them less mobile and more persistent. These properties are discussed in reference to methods of application for greatest activity.

73-0292. Kramer, R. E.; Plapp, Jr., F. W. (Dept. of Entomol., Texas A&M Univ., College Station, TX 77843). **DDT residues in fish from the Brazos River Basin in central Texas.** *Environ. Entomol. 1(4): 406-409; 1972.* (10 references)

DDT, DDD (TDE), and DDE were the only insecticides detected in measurable quantities in muscle tissue from 13 species of fish collected at three stations in the Brazos River Basin of Texas. Highest total DDT residues were found in fish from the Brazos River which flows through intensively managed agricultural land. Fish from the Navasota River, which drains range land, contained lower residues and those from the Somerville Reservoir, in a non-cropland drainage system, contained the lowest residues. TDE and DDE were present in samples from all areas, but DDT was detected only in samples from the two lotic systems. Several species of gar were the only fish containing significant levels of DDT in the Somerville and Navasota systems, suggesting that they might be valuable as an indicator species. None of the total DDT residues was more than 1 ppm.

73-0293. Kearney, P. C.; Woolson, E. A.; Ellington, Jr., C. P. (Agr. Environ. Quality Inst., Agr. Res. Service, U.S. Dept. of Agr., Beltsville, MD 20705). **Persistence and metabolism of chlorodioxins in soils.** *Environ. Sci. Technol. 6(12): 1017-1019; 1972.* (6 references)

The persistence of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD) was determined in Hagerstown and Lakeland (MD) soils receiving 1, 10, or 100 ppm TCDD after 20, 40, 80, 160, and 350 days. After one year, 56 and 63% of the originally applied TCDD was recovered in the Hagerstown and Lakeland soils, respectively. Neither 2,7-dichlorodibenzo-*p*-dioxin (DCDD) nor TCDD could be detected in soils receiving 10, 100, and 1000 ppm of the 2,4-dichlorophenol or 2,4,5-trichlorophenol after 70 days. A polar metabolite of DCCD-^{14}C was detected by thin-layer chromatography in the ethanol soil extract. TCDD is degraded slowly in soils, and TCDD and DCDD are not biosynthesized by microbial condensation reactions. (Author abstract reprinted by permission of the American Chemical Society)

73-0294. Poirrier, M. A.; Bordelon, B. R.; Laseter, J. L. (Dept. of Biol. Sci., Louisiana State Univ., New Orleans, LA). **Adsorption and concentration of dissolved**

carbon-14 DDT by coloring colloids in surface waters. *Environ. Sci. Technol. 6(12): 1033-1035; 1972.* (15 references)

Laboratory studies using natural surface water demonstrate that coloring colloids adsorb ^{14}C-DDT and that it can become concentrated from 0.168 ppb by wt in water to 15,800 times that concentration in coloring colloids. A mechanism is proposed whereby high concentrations of DDT could accumulate on stable colloids and could be transported great distances over inland waters to estuaries and the ocean. This accumulated DDT could be introduced into food chains and sediments as colloids precipitate or in some other way leave the water phase. (Author abstract reprinted by permission of the American Chemical Society)

72-0295. Kamil'dzhanov, A. K.; Khasanov, Y. U. (Uzbek Occup. Health Res. Inst., Tashkent, USSR). **On residual fozalon (phosalone) in apples and alfalfa.** *Hyg. Sanit. 36(6): 466-467; 1971.* (2 references)

English translation; for an abstract of the original Russian article, *Gig. Sanit.* 36(6): 104-105; 1971, see Abstract no. 72-0949.

73-0296. Hyndshaw, A. Y. (Carbon Tech. Service Lab., Westvaco Corp., Covington, VA). **Activated carbon to remove organic contaminants from water.** *J. Amer. Water Works Ass. 64(5): 309-311; 1972.* (1 reference)

A number of refractory organic substances, including pesticides, can be removed from water by activated carbon treatment either using the batch-contact or the more efficient percolation contact method. Generally, high molecular weight and low polarity favor adsorption. The two factors governing treatment are the amount of carbon required to give good taste and odor control and the points at which carbon should be applied to minimize influence from other chemicals. The most efficient order of addition is carbon first and oxidizer second. A reduction in threshold odor number (TON) has been used to measure the removal of parathion, lindane, malathion, 2,4-D, and DDT. Some heavy metals may soon be removed by a treatment involving activated charcoal.

73-0297. Whiting, F. M.; Brown, W. H.; Stull, J. W. (Dept. of Dairy and Food Sci., Univ. of Arizona, Tucson, AZ 85721). **Pesticide residues in tissues of first-born calves from dams on long-time, low DDT intake.** *J. Dairy Sci. 55(10): 1499-1501; 1972.* (7 references)

Three groups of unbred heifers consisting of four animals each were placed on one of three DDT intakes: 250, 500, or 1,000 ppb of the total feed consumed. After normal gestation and parturition, newborn calves were sacrificed from two dams in each group. Extractable lipid material from blood, brain, placenta, gonad, muscle, kidney, liver, and renal fat was analyzed for DDT and its metabolites. DDE was the most reliable indication of the dam's dietary pesticide history in most tissues whereas DDT and DDD (TDE) were not as reliable. Muscle lipid gave no indication of dietary history of the dam. Renal fat contained highest pesticides. (Author abstract by permission)

73-0298. Roth, H. (Plant Protection and Quarantine Programs, Animal and Plant Health Service, U.S. Dept. of Agr., Hoboken, NJ 07030). **Factors affecting concentrations of methyl bromide during and after fumigation of coniferous seeds.** *J. Econ. Entomol. 65(5): 1374-1376; 1972.* (6 references)

Use of a high initial vacuum (pressure reduced to 150 mm or less of mercury) is necessary to obtain satisfactory concentrations of methyl bromide in 45- to 50-kg bags of certain coniferous seed during 2-4 hours of atmospheric fumigation. High residual concentrations may persist during aeration. Reduced germination of seeds from the center of a bag of *Pinus mugo* var. *mughus* (Scop.) Zenari occurred following recovery of 20 milligrams per liter at 20 hours postaeration. (Author abstract by permission)

73-0299. Wolfenbarger, D. A.; Guerra, A. A. (Entomol. Res. Div., Agr. Res. Service, U. S. Dept. of Agr., Brownsville, TX 78520). **Toxicity of seven alkyl organophosphorus insecticides to the bollworm, pink bollworm, and tobacco budworm and persistence of naled in various formulations on cotton leaves.** *J. Econ. Entomol. 65(5): 1377-1380; 1972.* (12 references)

Trichlorfon and Bay S-2217 (2-chloroethyl methyl (2,2,2-trichloro-1-hydroxyethyl) phosphonate) were about equally toxic to larvae of the tobacco budworm, *Heliothis virescens* (F.), and trichlorfon and ethyl trichlorfon (diethyl(2,2,2-trichloro-1-hydroxyethyl)phosphonate) were equally toxic to larvae of the bollworm, *H. zea* (Boddie). However, trichlorfon was more toxic to tobacco budworms when it was applied as an ultra low volume spray (ULV, one-half gal or less per acre without water) than when it was used as a conventional spray (CLV, more than one-half gal per acre with water). Vapors of dichlorvos from impregnated wafers killed all moths of the pink bollworm, *Pectinophora gossypiella* (Saunders), within 24 hours for 19 days. The ULV sprays of naled formulated with some adjuncts maintained 57% or more of the applied naled on the surface of cotton leaves for 24 hours, but none remained on the surface more than two hours when the naled was applied as a CLV spray. (Author abstract by permission)

73-0300. Shrivastava, S. P.; Knowles, C. O. (Dept. of Entomol., Univ. of Missouri, Columbia, MO 65201). **Stability studies of iodofenphos insecticide.** *J. Econ. Entomol. 65(5): 1488-1490; 1972.* (2 references)

To test the stability of iodofenphos, solutions of the radiolabeled insecticide in various organic solvents were exposed to sunlight for 1-4 hours, returned to the laboratory, the solvents evaporated, and the residue examined by TLC/radioautography. Iodofenphos decomposed almost completely after 4 hr in carbon tetrachloride, and extensive decomposition also occurred in chloroform. Decomposition in methanol, even after 8 hr of exposure to sunlight, was minimal. Only slightly more extensive decomposition occurred in *n*-hexane whereas decomposition in ethyl acetate and acetone was moderate. Development of a violet color in the carbon tetrachloride solution during irradiation indicated iodine release. The major decomposition product in the carbon tetrachloride solutions cochromatographed with iodofenoxon. Other iodofenphos-related compounds also released iodine upon exposure to sunlight in carbon tetrachloride solution.

73-0301. Moyer, J. R.; McKercher, R. B.; Hance, R. J. (Saskatchewan Inst. of Pedol., Univ. of Saskatchewan, Saskatoon, Sask., Canada). **Desorption of some herbicides from montmorillonite and peat.** *Can. J. Soil Sci. 52(3): 439-447; 1972.* (20 references)

Desorption of monuron, atrazine, and prometryne from montmorillonite was tested immediately (i.e., after a 24-hr adsorption period) and following drying. Monuron and atrazine were reversible adsorbed in both cases. Immediately after desorption, less prometryne was desorbed than predicted, but after drying more was desorbed than predicted. With a peat preparation, monuron and atrazine were reversibly adsorbed if desorption was carried out immediately after adsorption, but, after drying to constant weight at 62% RH, desorption was not completely reversible. Sorption of prometryne and linuron by the peat was not completely reversible whether desorption was attempted immediately after adsorption or after drying. Desorption was reduced by the drying step with linuron, but not with prometryne. It is considered that degradation of the herbicides could not account for the irreversibility. (Author abstract by permission)

73-0302. Lakshminarayana, V.; Krishna Menon, P. (Central Plant Protection Training Inst., Hyderabad, India). **Exposure of the general population in Hyderabad to DDT.** *J. Food Sci. Technol. (Mysore) 9(2): 82-85; 1972.* (8 references)

Of the 214 food samples drawn at random from the Hyderabad market, 143 contained detectable amounts of DDT, aldrin, BHC, endrin, heptachlor, or lindane. DDT occurred in 94 samples, 70 values being above the tolerance limits of the U.S. Food and Drug Administration, whereas only 49 samples contained any of the other five pesticides. Based on the average DDT content of all the samples, an average normal daily intake would amount to 358.75 μg DDT or 72% of the accepted level. When only contaminated samples are considered, 735 μg would be consumed. The general population in Hyderabad is apparently exposed to significant quantities of DDT, but quantities below the level of accepted daily intake.

73-0303. Vasil'yev, V. P.; Kosmatyy, Ye. S.; Kudel', K. A.; Polonskaya, F. I.; Zatserkovskiy, V. A. (Ukrainian Res. Inst. of Plant Protection, Kiev, USSR). **Ostatki geptakhlora v rasteniyakh i pochve v zavisimosti ot sposoba yego primeneniya. [Heptachlor residues in plants and soil as affected by the method of its application.]** *Khim. Sel. Khoz. 10(3): 192-194; 1972.* (9 references) (Russian)

After heptachlor was applied for seed treatment during sowing or as a spray, residues were determined in corn, sugar-beet, and winter wheat and in the soil. The heptachlor consumption for sugar-beet and winter wheat seed treatment was 0.48 kg/100 kg, and for corn 0.42 kg/100 kg. Forty days after sprouting, sugar-beets contained no heptachlor. The time required for the complete elimination of heptachlor from green parts and roots of corn after sprouting was 45 days and 75 days, respectively. Young wheat plants contained heptachlor residues of 1.3-1.6 mg/kg over the winter period; the elimination was completed by late April. Heptachlor at 2 kg/ha, mixed with 98% of superphosphate, was introduced into the soil at 2-3 cm depth during sowing in another experiment. The time required for the complete elimination of heptachlor from young corn and sugar-beet plants after sprouting was 15 and 50 days, respectively. When heptachlor was applied in spray form at 1.2 kg/ha (500 l/ha), full elimination was observed after 45 days in sugar-beet plants, after 66 days in soil, and after 35 days in green parts of corn plants. The elimination was completed after 70 days when seed treatment plus spray were applied. Crops never contained heptachlor residues regardless of mode of application. The results eliminate problems of residue accumulation in crops and soil provided the recommended application levels and times are observed.

73-0304. Fateyeva, O. F. (Kazahk Res. Inst. of Plant Protection, USSR). **Ostatki DDT v pochve i kornyakh yabloni posle mnogokratnoy obrabotki sadov preparatom. [DDT residues in the soil and in roots of apple trees following repeated spraying.]** *Khim. Sel. Khoz. 10(3): 195-198; 1972.* (8 references) (Russian)

DDT residues were determined in the soil and roots of apple trees after two or three spray applications (1,500 l/ha, containing 7 g of DDT per liter) in spring. The DDT contents were highest in the upper 0-5 cm and lowest in 20-40 cm of soil. After DDT application was discontinued, the DDT content in the soil decreased by 52.4-63.2% during the first year and by 20-36% during the following 2-3 years. The reduction was greatest in the upper 0-5 cm primarily due to penetration of the

residues. The initially high DDT content in roots in the upper soil layer decreased considerably two years after DDT was discontinued. The residue levels in the soil and the roots were correlated. Although the residues in fruits were negligible, apple seeds contained large amounts of DDT (4.67-60 mg/kg).

73-0305. Kovaleva, Ye. S.; Talanov, G. A. (All-Union Res. Inst. of Vet. Hyg., Moscow, USSR). **Dinamika ostatkov GKhTsG v kormovykh kul'turakh. [Dynamics of hexachlorocyclohexane (BHC) residues in fodder crops.]** *Khim. Sel. Khoz. 10(4): 283-286; 1972.* (5 references) (Russian)

Variations in γ-BHC (lindane) residues were studied in plant parts and various crops. Corn, oat, vetch, sugar-beet, turnip, and potato were sprayed with γ-BHC at 1.5, 2, and 10 kg/ha twice at 15 day intervals; clover was sprayed once with one of two preparations containing γ-BHCat 3, 6, 15, and 30 kg/ha. The plant parts and crops generally contained low γ-BHC levels which remained constant during July-September. Residues were 0.064 mg/kg in green parts of corn, 0.06-0.204 mg/kg in turnip and sugar-beet tops, 0.068-0.35 mg/kg in oat stems, 0.016-0.48 mg/kg in clover, and 0.16-5.52 mg/kg in vetch stem. Grains usually had fewer residues than stems and leaves (6-58 times less in oats and 3-11 times less in vetch). Among root crops the residues were highest in turnip and sugar-beet and lowest in potato; 75-99% of the total residue was found in the peels. The residues in the pulp were low (0.012-0.044 mg/kg) regardless of amount of spray. Absorption from the soil was primarily responsible for the residues, and the absorption and elimination were in equilibrium.

73-0306. Aucamp, P. J.; Henry, J. L.; Stander, G. H. (Div. of Sea Fisheries, Dept. of Industries, Sea Point, Cape Town, S. Africa). **Pesticide residues in South African marine animals.** *Mar. Pollut. Bull. 2(12): 190-191; 1971.* (5 references)

Four species of marine animals from the west coast of South Africa, far from arable land, contained high levels of DDT and its metabolites. In both the snoek and rock lobster the total DDT levels in the digestive tract were as high as 1.41 ppm, several orders of magnitude higher than in the flesh, as were dieldrin levels. Liver of Risso's dolphin contained 0.140 ppm and blubber contained 0.256 ppm total DDT. Anchovy had levels from 0.196 to 0.228 ppm. Dieldrin generally occurred at lower concentrations.

73-0307., Yamaura, Y.; Maki, S.; Maruyama, S.; Kobayashi, M. (Nagano Prefectural Inst. of Hyg. and Pollution, Nagano, Japan). **[On the accumulation of organochlorine compounds in animal tissues II. Organochlorine pesticide residues in the liver of dogs.]** *Nippon Koshu Eisei Zasshi (Jap. J. Pub. Health) 19(10): 400; 1972.* (Japanese)

Organochlorine pesticide residues of α-, β-, γ-, and δ-BHC, *p,p'*- and *o,p'*-DDT, *p,p'*-DDE, *p,p'*-DDD(TDE), aldrin, dieldrin, endrin, heptachlor, and heptachlor epoxide were determined in the livers of 53 stray dogs caught in six districts. The method of extraction followed that in the FDA *Pesticide Analytical Manual* and the analysis was carried out by GC with ECD using three kinds of column packing. Aldrin, endrin, heptachlor, and *o,p'*-DT were not detected in all specimens. Persistent pesticides such β-BHC and dieldrin were frequently detected with averages of 0.015 and 0.016 ppm, respectively. The order of BHC isomers detected was β>α>γ>δ-BHC; there was no relationship between the level of β- and that of α-BHC. DDT-derived residues were detected in the order *p,p'*-DDT > *p,p'*-DDE. Heptachlor epoxide was found in 87% of the specimens. Although local differences could not be clearly noticed, the BHC levels seemed to be higher in fruit growing districts, DDT in fruit and vegetable growing districts, and chlorinated cyclodienes higher in vegetable growing districts. All the residues were higher in males than in females. Levels detected for males and females respectively in ppm were: 0.035 and 0.021 total BHC; 0.0038 and 0.0022 total DDT; 0.019 and 0.015 dieldrin; and 0.0030 and 0.0006 heptachlor epoxide.

73-0308. Mizoguchi, M.; Yamagishi, T.; Ushio, F.; Fujimoto, C.; Takeba, K.; Kani, T.; Haruta, M.; Yasuhara, K.; Kubota, H. (Tokyo Metropolitan Pub. Health Res. Lab., Tokyo, Japan). **[On the residual amount of organochlorine pesticides in human milk in Tokyo metropolitan area.]** *Nippon Koshu Eisei Zasshi (Jap. J. Pub. Health) 19(10): 541-544; 1972.* (6 references) (Japanese)

Human milk specimens were taken from 30 women at 1,2,4, and 12 weeks post-partum to study changes in pesticide residue levels. Levels were traced in five mothers for eight months. Blood specimens were also taken for pesticide determination. The extraction and cleanup of pesticides in the milk were carried out following the method in the FDA *Pesticide Analytical Manual* Vol. 1; the determination was carried out with dual column GLC. The pesticide in the blood was extracted by the method of Dale (*J. Ass. Offic. Anal. Chem.* 53: 1286-1292; 1970) and determined by GC; α-, β- and γ-BHC, *p,p'*-DDT, *p,p'*-DDE, and dieldrin were detected in all milk and blood specimens. *o,p'*-DDT and δ-BHC were present only in some milk specimens; No statistical difference was found in the average levels of organochlorine pesticide residues in human milk. The levels were 2.5, 2.0, and 0.15 ppm, respectively, for total BHC, total DDT, and dieldrin on a fat basis. No clear conclusion could be obtained from the eight months' tracing because of the few cases. No clear relationship was found between the levels of pesticide residues in human milk and those in the blood.

73-0309. Kasai, A.; Asanuma, S.; Nakamura, S. (Japan Inst. of Rural Med., Usuda, Nagano Prefect., Japan). **[Studies on organochlorine pesticide residues in human organs, Part III.]** *Nippon Noson Igakkai Zasshi (J. Jap. Ass. Rural Med.) 21(2): 296-297; 1972.* (Japanese)

The residual amounts of banned organochlorine pesticides were determined in humans. Blood samples were taken from 70 farmers and 68 non-farmers in March, 1971. All the organochlorine pesticides were found in all the specimens except for DDT (88.6%) and dieldrin (97.3%). The residual amounts averaged 2.3 ppb α-BHC, 8.4 ppb β-BHC, 5.9 ppb γ-BHC, 2.3 ppb DDT, 14.4 ppb DDE, and 1.1 ppb dieldrin. No differences were found between levels in farmers and non-farmers. However there were positive correlations between the β-BHC and DDE residue amounts and the amounts of beef eaten. To determine placental permeability of organochlorine pesticides 10 specimens of newborns' and mothers' blood at the time of delivery were analyzed. The values show great permeability for γ-BHC, smaller for α-BHC, and similar for β-BHC and DDE. Organochlorine pesticide residues were determined in 1971 and 1972 in human fats; all were higher in 1971 than in 1972, except dieldrin. Organochlorine pesticide residues except γ-BHC and dieldrin were significantly higher in 28 tumor patients than in 38 patients suffering from other diseases.

73-0310. Suzuki, Y.; Tatsumi, M.; Sugaya, A.; Meguro, Y.; Sasaki, S. (Inst. of Rural Med., Hiraga Gen. Hosp., Akita Prefect. Welfare Federation, Akita Prefect.,Japan). **[Report of the residual amount of organochlorine pesticides in human organs, 1971.]** *Nippon Noson Igakkai Zasshi (J. Jap. Ass. Rural Med.) 21(2): 298-299; 1972.* (Japanese)

The results of tracing organochlorine pesticide residues in human milk and human fats and a comparison of results from 1970 and 1971 are reported. In 1970 BHC (α-, β- and γ-), DDT (*p,p'* and *o,p'*-), DDD (TDE) (*p,p'*-), DDE, and dieldrin were detected in all milk specimens. The average contents on a fat basis were 0.14, 0.65, 0.08, 1.17, 0.16, 0.09, 2.20, and 0.38 ppm in the above order. The ratio of α-, β-, and γ-BHC was 16:75:9, suggesting a higher persistence and solubility of the β-isomer in fats. In 1971 γ-BHC and DDD were scarcely found; the average contents of the above pesticides in human milk were 0.06, 3.20, trace, 0.83, 0.14, trace, 2.48, and 0.28, respectively. The ratio of α-, β- and γ-isomers was 2:98:trace, suggesting an increase in β-isomer content. The content of organochlorine pesticide residues in four primiparae was higher than that in seven multiparae which suggests a dependence of residue content on the amount and kind of diet. In 1971 the content of β-BHC in human fat increased; the ratio of α-, β- and γ-BHC changed from 4:95:1 in 1970 to 1:98.5:0.5 in 1971. Total DDT decreased, especially values of *o,p'*-DDT and DDE.

73-0311. Oura, H.; Kobayashi, H.; Oura, T.; Senda, I.; Kubota, K. (Toyama Prefect. Res. Lab. of Pub. Health, Toyama, Japan). **[On the pollution of human milk by PCB and organochlorine pesticides.]** *Nippon Noson Igakkai Zasshi (J. Jap. Ass. Rural Med.) 21(2): 300-301; 1972.* (Japanese)

PCBs and organochlorine pesticide residues were determined in human milk in Toyama Prefecture. Thirty 120 ml specimens were collected from women in rural areas and cities 1-3 months postpartum. The method of determining the organochlorine pesticide residues followed the *Pesticide Analytical Manual* of FDA and that of determining PCB was by GC with ECD using a standard mixture of commercial PCB. Alpha- and β-BHC, *p,p'*-DDT, *p,p'*DDE, and dieldrin residues were detected. Delta-BHC, *p,p'*DDD(TDE), and heptachlor epoxide were seldom found. PCBs were detected in specimens at levels of 0.03 (whole base) and 1.1(fat base) ppm. The level of PCBs was nearly comparable to those of β-BHC and total DDT. No difference was found between the contents of organochlorine compounds in milks of rural and city mothers. Overall pollution of human milk was low in Toyama Prefecture compared to other parts of Japan and compared to the levels obtained 10 months previously. DDT, DDE, and dieldrin levels decreased, β-BHC did not. The average level of β-BHC was 0.049 ppm (whole base), and that of *p,p'*-DDT 0.033 ppm (whole base).

73-0312. Funazaki, Z.; Asanuma, N.; Otsuji, H. (Japan Inst. of Rural Med.,Usuda, Nagano Prefect., Japan). **[On the residues of herbicides in soil. Part I. On the residual amount of 2,4,5-T and Na-PCP in the soil of forest.]** *Nippon Noson Igakkai Zasshi (J. Jap. Ass. Rural Med.) 21(2): 304-305; 1972.* (Japanese)

2,4,5-T minute granules were applied for 12 and 18 mo in Suwa and Kiso forests at the rate of 2.4 kg and 3.2 kg/ha respectively. Soil was collected at depths of 0-10, 10-20, and 20-30 cm and analyzed for 2,4,5-T by GLC. After 12 mo of application the maximum residue levels were 0.0624 ppm (Suwa, 0-10 cm) and 0.0374 ppm (Kiso, 0-10cm) and the average levels were 0.0087 (Suwa) and 0.0073 (Kiso). After 18 mo the average levels were 0.0028 (Suwa) and 0.0107 (Kiso). The level was higher in the soil nearer to the surface and decreased with time. Care must be taken when applying the herbicides in forests which supply drinking water. Specimens of paddy field soil in Usuda district where Na-PCP had been applied until four years ago and specimens of upland soil in cabbage fields where Na-PCP had been applied recently were collected. Na-PCP remained in all the paddy field soils at the average level of 0.032 ppm and at still higher levels in cabbage field soil where it averaged 0.911 ppm. Persistence of Na-PCP in paddy field soil is greater than expected and may cause water pollution.

73-0313. Yamaguchi Prefecture Research Institute of Health, (Yamaguchi, Japan). **[Results of PCP estimation in the air near an agricultural chemicals manufacturing plant in the town of Ogori.]** *Yamaguchi-ken Eisei Kenkyusho Kenpo (Ann. Rep. Yamaguchi Prefect. Res. Inst. Health) 13(2): 77-78; 1971.* (Japanese)

The concentration of pentachlorophenol (PCP) in the smokestacks of a manufacturing plant and in the air near the factory was estimated. At the time of measurement the plant was operating at 25% capacity and the wind was from the NNW at an average of 2.2 miles per hour. Air in the smokestacks was collected by impinger, and outdoor air was collected with high-volume samplers at points 200 m to the northeast, 300 m to the southeast, and 500 m to the south of the factory. The average PCP concentration in the exhaust gas was 1.06 mg/m^3, and morning and afternoon peaks of 3.90 and 2.32 mg/m^3 were recorded. PCP concentrations in the air outside the factory were below the limit of detection (0.0025 mg/m^3). Complaints of PCP pollution in the vicinity of the factory were due to PCP spillage from bags carried from the factory.

73-0314. Beynon, K. L.; Stoydin, G.; Wright, A. N. (Shell Res. Ltd., Woodstock Agr. Res. Centre, Sittingbourne, Kent, England). **A comparison of the breakdown of the triazine herbicides cyanazine, atrazine, and simazine in soils and in maize.** *Pestic. Biochem. Physiol. 2(2): 153-161; 1972.* (11 references)

The degradation of Bladex (cyanazine) in soils and in maize was compared with that of atrazine and simazine. In soil Bladex was changed by hydrolysis of the nitrile group to amide and acid; hydrolysis of the 2-chloro group also occurred. There was relatively little dealkylation. Residues of atrazine and simazine were almost 12 times greater than those of Bladex 70 days after application. Hydrolysis of the chlorine atom, along with some dealkylation, accounted for the degradation observed. Total residues of chlorotriazines present in the three soils after 70 days were similar. Maize sap treated with Bladex contained the hydroxy acid and a salt or sugar conjugate of the carboxylic acid after 22 hr. Only the hydroxy analog of atrazine was detected in sap and degradation was slower. Plants grown in soil treated with atrazine and simazine had higher residues than those grown in Bladex-treated soil; hydroxy triazines or conjugates were the most prevalent metabolites. With Bladex treatment chlorotriazines and hydroxy triazines including dealkylated derivatives were present.

73-0315. Moore, J. B. (McLaughlin Gormley King Co., Minneapolis, MN). **Terminal residues of pyrethrin-type insecticides and their synergists in foodstuffs.** *Pyrethrum Post 11(3): 106-110, 124; 1972.* (4 references)

Low residues of pyrethrins and piperonyl butoxide have been measured on and in food products using new GC techniques. Tests were set up to simulate regular application of pyrethrins, although with chickens a high dosage of dipping was used in order to give measurable residues. Foodstuffs were treated with and without plastic wrapping. Exposed Brazil nuts contained the highest residues in fatty foods: 2.3 ppm pyrethrin I; 2.2 ppm pyrethrin II; 7.5 ppm piperonyl butoxide and 16 ppm MGK(*N*-(2-ethylhexyl-5-norbornene-2,3-dicarboximide). Data are also given for margarine, bacon, codfish, potatoes and potato chips, grain, chickens, and eggs.

73-0316. Kawahara, T. (Agr. Chem. Inspection Station, Min. of Agr. and Forestry, Kodaira, Tokyo, Japan). **[BHC in milk.]** *Shokubutsu Boeki (Plant Protect.) 26(9): 378-381; 1972.* (Japanese)

BHC-isomers were determined in milk samples collected from 41 cows and the relationship between the residue and the feed examined. The make up of total feed varied season to season as did BHC content in daily diet. As a rule, β-BHC was high and δ-BHC low in all the concentrated feed constituents; total BHC content was low in roughage. BHC was detected in all milk samples with a constant but small content of γ-and δ-isomers (<0.002 ppm), a large but irregular content of β-isomer (0.09-0.005 ppm), and with a small but constant content of α-isomer (0.036-0.0092 ppm). The temporary tolerance of β-BHC in milk in Japan is 0.2 ppm. BHC-content in the feed and in the milk were correlated, especially for α-and β-isomer although BHC content in milk did not depend on the specific feed constituent. Once a high accumulation of BHC is established in lactating cows, the newly supplied BHC is excreted by a linear relationship such as found in experimental rats. BHC is excreted in feces, urine, and body fluids; total BHC found in a representative animal was 22.35 ppb in feces, 1.19 ppb in urine, and 0.35 ppb in milk. Gas chromatography was used to determine BHC metabolites (2,4-and 2,6-dichloro-, 2,4,6- and 2,5,6-trichlorophenol, 1,2,3- and 1,2,4-trichlorobenzene, and 2,3,4,6-tetrachlorophenol) in urine and feces. No amounts were detected.

73-0317. Mills, A. C.; Biggar, J. W. (Dept. of Water Sci. & Engineering, Univ. of California, Davis, CA 95616). **Solubility-temperature effect on the adsorption of gamma- and beta-BHC from aqueous and hexane solutions by soil materials.** *Soil Sci. Soc. Amer. Proc. 33(2): 210-216; 1969.* (10 references)

Freundlich adsorption isotherms were obtained for gamma- and beta-isomers of 1,2,3,4,5,6-hexachlorocyclohexane (BHC) adsorbed from aqueous and hexane solvents on Ca-Staten peaty muck, Ca-bentonite Ca-Venado clay, and silica gel in the temperature range of 10 to 40C. Comparison of normal and "corrected" isotherms revealed a significant effect on adsorption due to the influence of temperature on solubility. The $1/n$ constants of the Freundlich equation increased with

temperature according to the theory of dilute solutions. When the solubility effect is removed, the gamma isomer has greater adsorbability than the beta isomer, possibly because the former possesses a dipole moment whereas the latter does not. At constant solution fugacities, the gamma isomer on Staten peaty muck competed somewhat more effectively with hexane than with water. (Author abstract by permission)

73-0318. Konrad, J. G.; Chesters, G.; Armstrong, D. E. (Soils Dept., Univ. of Wisconsin, Madison, WI). **Soil degradation of malathion, a phosphorodithioate insecticide.** *Soil Sci. Soc. Amer. Proc. 33(2): 259-262; 1969.* (8 references)

Rates of malathion degradation in soils were related directly to extent of malathion adsorption, suggesting that degradation occurred by a chemical mechanism which was catalyzed by adsorption. Malathion degradation was rapid (50 to 90% in 24 hours depending on the type of soil) in both sterile and non-sterile soil systems, and no lag phase occurred prior to degradation. In aqueous soil-free systems inoculated with a soil extract, a lag phase (7 days) occurred, followed by rapid malathion loss, likely due to microbial degradation. Thus in soils, complete chemical degradation of malathion occurred prior to microbial adaptation to malathion. To obtain information on the pathway and products of malathion degradation, chemical hydrolysis in soil-free systems was investigated using liquid:liquid partition techniques with ^{14}C-labeled malathion. Hydrolysis did not occur in acid systems (>pH 2), was slow at pH 9 (<50% in 20 days) and rapid at pH 11 (>99% in 1 day). At pH 9 the hydrolysis resulted in formation of thiomalic acid and dimethyl thiophosphoric acid as final products with accumulation of diethyl thiomalate as an intermediate due to unequal rates of hydrolysis of the ester linkages. In soils both ester linkages are hydrolyzed, although not at the same rate, resulting in the accumulation of diethyl thiomalate in some soils. (Author abstract by permission)

73-0319. Johnson, L. R.; Hiltbold, A. E. (Dept. of Agronomy and Soils, Auburn Univ. Exp. Station, Auburn, AL). **Arsenic content of soil and crops following use of methanearsonate herbicides.** *Soil Sci. Soc. Amer. Proc. 33(2): 279-282; 1969.* (11 referencs)

Distribution of As with depth in soil was determined after four years of repeated applications of monosodium (MSMA), monoammonium (MAMA), and disodium methanearsonate (DSMA) to turf. Arsenic concentration decreased with depth. Percentage recovery of applied As in the upper 30 cm of soil decreased with increasing application rates. Yields of cotton (*Gossypium hirsutum* L.), soybeans (*Glycine max* L. Merr.), sorghum-sudan hybrid (*Sorghum vulgare* Pers. X *S. sudanense* (Piper) Stapf), corn (*Zea mays* L.), oats (*Avena sativa* L.), vetch (*Vicia villosa* Roth), and crimson clover (*Trifolium incarnatum* L.) were not affected by previous As treatments. Seed of cotton and soybeans accumulated more As than corn or forage from sorghum or the winter crops. Uptake of residual As was greater from MSMA than from DSMA or MAMA, and from the high rate of application than from the medium or low rates. About 90% of the soil As content occurred in the clay fraction. Much of the soil As was extracted by NH_4CL that removed little if any P. Most of the soil P was associated with iron minerals and organic matter while As was associated with aluminum. No appreciable organic As was found. (Author abstract by permission)

73-0320. Huggenberger, F.; Letey, J.; Farmer, W. J. (Dept. of Soil Sci. and Agr. Engineering, Univ. of California, Riverside, CA 92502). **Observed and calculated distribution of lindane in soil columns as influenced by water movement.** *Soil Sci. Soc. Amer. Proc. 36(4): 544-548; 1972.* (9 references)

Observed and calculated distributions of lindane in soil columns of infiltration experiments were compared. Three mineral soils with different organic matter contents and particle size distributions were used in the study. The adsorption coefficient (K') and rate of adsorption (α) were determined in independent experiments. As predicted by the theory, application of a greater amount of lindane to the soil surface increased the concentration of lindane but did not influence the depth of penetration. Under leaching conditions, the depth of water penetration divided by K was a good estimate of the observed depth of maximum concentration of lindane. The theory failed in general to predict the shape of the distribution curve of lindane. (Author abstract by permission)

73-0321. Mustafa, M. A.; Gamar, Y. (Dept. of Biochem. and Soil Sci., Fac. of Agr., Univ. of Khartoum, Khartoum, North Sudan). **Adsorption and desorption of diuron as a function of soil properties.** *Soil Sci. Soc. Amer. Proc. 36(4): 561-565; 1972.* (17 references)

The study was conducted to determine the properties of 12 arid-zone soils low in organic matter (0.1-1.7%) that are responsible for the adsorption and desorption of diuron [3-(4,4-dichlorophenyl)-1,1-dimethylurea]. Statistical analysis rendered r^2 values for diuron adsorbed in relation of CEC, specific surface area, and organic carbon percentage equal to 0.785, 0.754, and 0.476, respectively. It was concluded that CEC or specific surface area can account for the variability of diuron adsorption in arid-zone soils. Variability of diuron desorbed was basically due to diuron initially adsorbed ($r^2 = 0.864$). Again desorption could be predicted from specific surface area ($r^2 = 0.846$) or CEC ($r^2 = 0.828$) and not from organic carbon percentages ($r^2 = 0.372$). Multiple regression analysis did not practically improve the linear relationship obtained from adsorption and desorption. (Author abstract by permission)

73-0322. Yaron, B.; Saltzman, S. (Inst. of Soils and Water, Agr. Res. Org., Volcani Center, Bet Dagan, Israel). **Influence of water and temperature on adsorption of parathion by soils.** *Soil Sci. Soc. Amer. Proc. 36(4): 583-586; 1972.* (13 references)

The adsorption of parathion by soils was investigated using ^{14}C-parathion. Aqueous and hexane solutions ranging from 1 to 10 μg parathion/ml were applied to three soil types under different conditions. No appreciable thermic effect was observed during adsorption of parathion from aqueous solution after correction for increased solubility. Parathion was adsorbed from hexane solution on dry soil but not on hydrated soil. Increasing soil water content resulted in decreasing parathion adsorption. Adsorption was similar at 10° and 30° in soil-hydrated parathion-hexane systems and increased at 50°. Adsorption sites are probably freed in this system at elevated temperatures by water desorption.

73-0323. Nearpass, D. C. (U.S. Soils Lab., SWC, Agr. Res. Service, U.S. Dept. of Agr., Beltsville, MD 20705). **Hydrolysis of propazine by the surface acidity of organic matter.** *Soil Sci. Soc. Amer. Proc. 36(4): 606-610; 1972.* (23 references)

Propazine [2-chloro-4, 6-bis (isopropylamino)-*s*-triazine] hydrolysis in acidic aqueous soil-free systems was pH dependent, increasing with lower pH values. At a given pH, degradation followed first-order kinetics. At 23.5C, the relationship was log $t½$ (days) = 0.59 pH −0.21. Adsorption of propazine by organic matter prepared from Michigan peat was also pH dependent, but both molecular and cationic adsorption occurred. An increased rate of degradation in the presence of organic matter was postulated as due to hydrolysis by ionized surface hydrogen. Increasing the calcium saturation resulted in decreased hydrolysis. Increasing the $CaCl_2$ concentration of the propazine-organic matter-aqueous system had no effect on acid hydrolysis. In the salt-amended systems, an increased hydrolysis, to be expected from the lower pH in the ambient solution, was apparently offset by a decreased hydrolysis due to the lowered amounts of ionized surface hydrogen. (Author abstract by permission)

73-0324. Scott, H.; Phillips, R. E. (Kentucky Agr. Exp. Station, Lexington, KY 40506). **Diffusion of selected herbicides in soil.** *Soil Sci. Soc. Amer. Proc. 36(5): 714-719; 1972.* (17 references)

Diffusion coefficients of atrazine, simazine, prometone, prometryne, 2,4,-D, chlorpropham, diphenamid, fluometuron, trifluralin, and benefin, were measured in Lanton silty clay loam. The effects of soil moisture content and adsorption upon the diffusion coefficient were evaluated. Differences were observed in the magnitude of diffusion coefficients of the ^{14}C-labeled herbicides in the soil. The self-diffusion coefficients of 2,4-D, chlorpropham, diphenamid, and prometone decreased as diffusion time increased, which suggests that changes in the structure of these herbicides might have occurred. The self-diffusion coefficients of fluometuron, atrazine, simazine, prometryne, trifluralin, and benefin were found not to be significantly changed as diffusion time increased. The rate of diffusion increased as the soil water content increased for all herbicides except trifluralin. Diffusion of trifluralin was higher at the lower moisture content and this was attributed to a greater amount of trifluralin moving in the vapor phase. Linear adsorption isotherms were obtained with all herbicides. The order of adsorption was 2,4-D < fluometuron ≅ prometone < simazine ≅ atrazine ≅ diphenamid < prometryne << chlorpropham << trifluralin << benefin. Correlation analysis showed that the diffusion coefficients of the non-volatile herbicides were inversely related to the amount of adsorption indicating that most of the diffusion occurred in the solution phase. For those herbicides that are considered to be volatile, diffusion occurred in the vapor phase and the solution phase. (Author abstract by permission)

73-0325. Wang, C. H.; Broadbent, F. E. (Dept. of Soils and Plant Nutrition, Univ. of California, Davis, CA 95616). **Kinetics of losses of PCNB and DCNA in three California soils.** *Soil Sci. Soc. Amer. Proc. 36(5): 742-745; 1972.* (21 references)

The losses of two fungicides, PCNB (pentachloronitrobenzene) and DCNA (2,6-dichloro-4-nitroaniline) in three California soils differing in their properties were measured in laboratory experiments. Under controlled temperature and moisture content, both fungicides were lost according to first-order kinetics. The calculated half-time ($t½$) was employed to indicate the stability or the persistence of the fungicides. The half-times of PCNB were 4.7, 7.6, and 9.7 months for Columbia fine sandy loam, Sacramento clay, and Staten peaty muck, respectively, while those of DCNA were 30, 16.2, and 13.6 months, respectively. Thus higher soil organic matter was associated with slower PCNB loss but enhanced DCNA loss. It was also found that clay affected losses of the fungicides in a similar way. Evidence was obtained to show that PCNB was lost mainly through volatilization whereas DCNA was lost through microbial degradation and other processes. (Author abstract by permission)

73-0326. Fahmy, M. A. H.; Fukuto, T. R. (Dept. of Entomol., Univ. of California, Riverside, CA 92502). **Oxidative rearrangement of *N*-(dimethoxyphosphinothioyl)carbamate esters.** *Tetrahedron Lett. 41: 4245-4248; 1972.* (5 references)

The mechanism of oxidation of 2,2-dimethyl-2,3-dihydrobenzofuranyl-7-*N*-methyl-*N*-(dimethoxyphosphinothioyl) carbamate (I) was studied using *m*-chlorobenzoic acid as oxidizing agent. The basis for selectivity of the compound is probably the difference in the ability of insects and

mammals to metabolize the compound to the toxic carbamate (II). Under the conditions used, I oxidatively rearranged to the corresponding *N*-dimethoxyphosphinothio derivative, in addition to direct desulfuration to the expected *N*-dimethoxyphosphinyl derivative. Some II was isolated from the reaction medium along with sulfur. The oxidation of I apparently proceeds through an unstable *S*-oxide intermediate.

73-0327. Underwood, J. G. (Brit.-Amer. Tobacco Co., Ltd., Group Res. and Dev. Centre, Southampton, England). **The radiochemical analysis of phosphine residues in fumigated tobaccos.** *Tobacco Sci. 123: 47-50; 1972.* (23 references)

A 96-hr aeration of tobacco which had been fumigated with ^{32}P phosphine for 96 hr was sufficient to remove all phosphine gas, but a residue of chemisorbed phosphorus compounds of 0.45 to 3.22 ppm, depending on the type of tobacco and the moisture content, remained. Hot water extraction removed these residues which were mainly orthophosphate and a small amount of pyrophosphate. No trace of phosphite or hypophosphite was found. Chemisorbed materials were not transferred into main-stream smoke, on smoking cigarettes made from each of the fumigated tobaccos, and in the ash. The principal form of residue was phosphate.

73-0328. Dimitrov, S.; B"leva, R. (Inst. Biol. and Pathol. of Reproduction and Non-Infectious Diseases, Sofia, Bulgaria). **Prouchvaniya v"rkhu prod"lzhitelnostta na zad"rzhane na Sevin v lyutsernovo seno. [Studying the Sevin (carbaryl) retention time in alfalfa.]** *Vet. Med. Nauki 8(6): 51-57; 1972.* (11 references) (Bulgarian)

Application of Sevin (carbaryl) to alfalfa in 20 and 40 g/100 m^2 doses indicated that retention time of the compound depends on the dose, the mowing time, and the drying procedure of the obtained feed. Sun dried hay treated with the higher dose and mown 7 to 13 days after treatment contained Sevin in amounts ranging from traces to 104 ppm after 78 to 105 days storage. No traces of the compound were found if mowing was done 13 to 21 days after treatment and drying occurred in the dark. Hay samples obtained from alfalfa treated with the lower dose of Sevin contained 10.8, 6.2, 4.1, 1.8, and 0.18 ppm of the compound when mowing was performed 3, 7, 10, 13, and 15 days after treatment, respectively, and drying occurred in the sun. No Sevin was detected in hay samples mown 10 days after treatment and dried in the dark. Thus alfalfa should be mown more than 21 days after treatment with Sevin, dried in the dark, and used for feed after 2.5 months of storage.

73-0329. Minasyan, S. A.; Pashyan, R. P. (Inst. of Epidemiol. and Hyg., Armenian SSR Ministry of Pub. Health, Yerevan, USSR). **Soderzhaniye ostatochnykh kolichestv DDT v produktakh pitaniya rastitel'nogo proiskhozhdeniya v nekotorykh rayonakh Armyanskoy SSR. [DDT residues in farm crops in some areas of the Armenian SSR.]** *Vop. Pitan. 30(3): 83-84; 1971.* (1 reference) (Russian)

Residual quantities of DDT were determined in grapes, cabbage, onion, pepper, beet root, wheat, potato, and carrot grown in different parts of Armenia during 1963-1967. The DDT residue contents were highest in grapes (0.32-0.84 mg/kg), onion (0.42 mg/kg), and beet root (0.49 mg/kg) and followed by pepper (0.27 mg/kg) and cabbage (0.12 mg/kg). Except for samples from one vineyard, all samples contained DDT residues below the maximum allowable concentration. Samples from one farm where very small amounts of DDT were used contained no traces of DDT; other samples from one untreated patch contained DDT residues because of DDT application to adjacent patches. The variations in the DDT residue levels in samples from the same patch reflect uneven DDT distribution over the entire patch.

72-0330. Mel'nikova, Ye. A. (All-Union Res. Inst. of Pestic., Polymers, and Plastics, Hyg. and Toxicol., Kiev, USSR). **Ob ostatochnykh kolichestvakh grizeoful'vina v obrabotannykh im plodakh. [Residual amounts of griseofulvin in fruits treated with this antibiotic.]** *Vop. Pitan. 30(5): 76-78; 1971.* (5 references) (Russian)

Griseofulvin residues were determined by iodometric titration in grapes, gooseberries, currants, apples and their leaves and branches previously treated with this antibiotic. Griseofulvin remained in the fruits and plant parts for a long time and in large amounts with the last analysis performed 115 days after treatment. No noteworthy reduction in the residue content was observed after cold storage over 30 days. In view of the high stability and the teratogenic and co-carcinogenic effects of griseofulvin, its use in the treatment of farm crops should be discontinued.

72-0331. Hunter, J. H.; Stobbe, E. H. (Canada Dept. of Agr., Regina, Saskatchewan, Canada). **Movement and persistence of picloram in soil.** *Weed. Sci. 20(5): 486-489; 1972.* (13 references)

The movement and persistence of 4-amino-3,5,6-trichloropicolinic acid (picloram) in an Osborne clay soil was determined with soybean (*Glycine max* (L.) Merr. 'Altona') as the bioassay plant. Application rates ranged from 35 to 700 g/ha. Movement and dissipation of picloram were negligible under low soil moisture conditions, but under high rainfall conditions picloram was leached into the 30 to 60-cm depth. A greater percent of the picloram was leached at the higher application rates. Dissipation increased with temperature (days over 27 C) and decreased with increasing depth in the soil profile. Two applications of picloram at 70 g/ha applied in two successive years showed no detectable accumulation, but accumulation occurred from two applications of 350 g/ha; 32% of the activity remained after approximately two years. (Author abstract by permission)

See also 73-0273 73-0338 73-0339 73-0353 73-0346 73-0478

73-0332. Hunt, E. G. (Wildlife Management Branch, Calif. Dept. of Fish and Game, Sacramento, CA). **Wildlife and environmental contamination from pesticide chemicals.** *In: Agricultural Chemicals–Harmony or Discord for Food, People, and the Environment. J. E. Swift, Ed., Univ. Calif., Div. Agr. Sci., 1971. pp. 64-68.*

The reported losses of fish and wildlife due to pesticide poisoning in California were the lowest in 1970 in ten years. No losses were caused by the use of Azodrin (monocrotophos) in cotton fields, an important factor reducing the incidence of wildlife losses. Pesticide related fish losses have been associated with the use of chlorinated hydrocarbons such as Thiodan (endosulfan), DDT, toxaphene, and endrin. Pesticides which travel through the biological food chains and accumulate in the bodies of birds have caused the death of fish eating water birds at Tulelake, Big Bear Lake, and Clear Lake in recent years. Several studies have shown that low levels of DDT and DDE cause reproductive failures involving yolk absorption and eggshell thinning in pheasants. A new program of the California State Department of Agriculture requires prompt reporting of practically all pesticides and has become a helpful tool for assessing the input of pesticides into the environment. A preregistration and preuse testing system to provide an assurance that only those pesticides which do not cause harmful side effects be used is suggested.

73-0333. Milby, T. H. (Bureau of Occup. Health and Environ. Epidemiol., Calif. Dept. of Pub. Health, Berkeley, CA). **Effects of pesticides in occupational exposure.** *In: Agricultural Chemicals–Harmony or Discord for Food, People, and the Environment. J. E. Swift, ed., Univ. Calif., Div. Agr. Sci., 1971, pp. 80-85.*

With the increased use of organophosphates over chlorinated hydrocarbons, cases of organophosphate poisoning have increased among field workers in California. Organophosphates may enter the body through the mouth or lung or penetrate intact skin. They inhibit cholinesterase and cause nausea, vomiting, malaise, sweating, diarrhea, and weakness. Three confirmed outbreaks of organophosphate poisoning occurred among crews picking navel oranges in Tulare County during 1970. The Advisory Committee to the California Director of Agriculture subsequently recommended methods for preventing such episodes: prohibition or curtailment of the use of organophosphates; required use of personal protective devices; required periodic cholinesterase testing as a condition of employment; or appropriate waiting periods before resumption of contact with the crops. During a recent hearing, a safe entry interval was established for each organophosphate registered for use on citrus, grape, and peach crops. Questions raised during a discussion period dealt with the significance of various exposure routes and of exposure indices in the absence of clinical findings.

73-0334. Mitchell, J. C.; Dupuis, G.; Towers, G. H. N. (Div. of Dermatol. and Dept. of Botany, Univ. of Brit. Columbia, Vancouver 8, British Columbia, Canada). **Allergic contact dermatitis from pyrethrum (*Chrysanthemum* spp.). The roles of pyrethrosin, a sesquiterpene lactone, and of pyrethrin II.** *Brit. J. Dermatol. 86(6): 568-573; 1972.* (25 references)

A patient with a history of allergic dermatitis from pyrethrum showed positive patch test responses to pyrethrum flower heads and powder, extracts of the plant, pyrethrosin, and pyrethrin II. Pyrethrosin, which contains an unsaturated methylene group, produced positive reactions in a concentration of 2% w/v. Other compounds derived from pyrethrum, including chrysanthemumic acid, the ethyl ester of this acid, and the naturally occurring insecticidal esters, pyrethrin I, cinerin I and II, jasmolin I and II, and the synthetic ester allethrin and chrysanthemin, taraxasterol (pyrethrol), and tiglic acid produced negative patch tests.

73-0335. Fowle, C. D. (Centre for Res. on Environ. Quality, York Univ., Toronto, Canada). **Effects of phosphamidon on forest birds in New Brunswick.** *Can. Wildl. Serv. Rep. Ser. No. 16, 1972, p. 3-23.* (22 references)

Studies undertaken in New Brunswick forests in conjunction with a spruce budworm control program showed that operational aerial spraying of phosphamidon at 0.375 to 0.5 lb/acre could result in substantial mortality of forest birds. Population reductions in the censuses were noted regardless of dilution, and dead and sick birds were found. Early application was less hazardous to birds. Lower doses of about 0.25 lb/acre occasionally caused losses; with all doses the finer spray did more damage. Field and laboratory observations confirmed that lethal or intoxicating doses could be ingested or absorbed through the feet from sprayed vegetation. The oral LD50 ranged from 1 to 3 mg/kg for common forest birds. Frequent bill wiping, one of the symptoms observed in the laboratory, might be used as an indication of low level intoxication when incapacitated birds are not found.

73-0336. Davidson, J. K.; MacPherson, P. (Dept. of Diagnostic Radiol., Western Infirmary, Glasgow, Scotland). **Pulmonary changes in paraquat poisoning.** *Clin. Radiol. 23: 18-25; 1972.* (12 references)

Two cases of accidental ingestion of a small amount of Gramoxone (20% paraquat) are reported, as is a case of attempted suicide in which about 45 g of Weedol (5% solid paraquat formulation) was ingested. The Gramoxone produced marked ulceration of the mouth and throat in both cases while renal function deteriorated and then gradually improved. By the 6th and 7th day after ingestion, radiographs revealed progressive pulmonary fibroblastic alveolitis. Both patients died subsequently, one on day 25 and one on day 17.

No case of paraquat poisoning in which radiographic evidence of lung damage occurred has been reversed. Ingestion of Weedol produced renal failure, but no radiographic indication of pulmonary damage. The patient recovered by the ninth day. The reduced toxicity of Weedol may be related not only to its lower concentration of paraquat, but also to its solid state.

73-0337. Buck, W. B.; Osweiler, G. D.; Stahr, H. M.; Gelder, G. A. (Toxicol. Section, Vet. Diagnostic Lab., College of Vet. Med., Iowa State Univ., Ames, IA 50010). **Diagnostic procedures in veterinary toxicology.** *Clin. Toxicol. 5(2): 143-150; 1972.* (2 references)

A toxicologic diagnosis requires evidence obtained from a good history, description of clinical signs and postmortem changes, experimental studies, and chemical findings. Such evidence should be obtained using a team approach. Diagnostic procedures in toxicology should be integrated with microbiology, serology, and pathology in the routine determination of causes of animal health problems. Toxicoses may account for many of the undiagnosed disease problems in veterinary medicine. It is possible that many health problems are combined infectious and toxicologic conditions rendering etiological diagnoses difficult, if not impossible. Examples of specific toxicologic cases investigated by the Iowa Veterinary Diagnostic Laboratory are briefly described. These include poisoning by fluoride, aldrin, arsenic, copper, and strychnine. (Author abstract by permission)

73-0338. Dyck, J.; Arevad, K.; Weihe, M. (Author address not given). **Reproduction and pesticide residues in orchard passerine populations in Denmark.** *Dan. Ornithol. Foren. Tidsskr. 66(1,2): 3-29; 1972.* (50 references)

Three orchard areas in Denmark with typical high applications of insecticides were compared to three non-orchard areas, since no unsprayed orchards could be found, regarding reproduction in passerine bird populations from 1964 to 1966. Levels from 0.56 to 17 ppm total DDT were found in adult birds, and lindane was present in very low concentrations. The concentrations were not higher in birds found dead than in those sacrificed and were too low to have caused death. Mortality did not vary greatly between test and reference areas. Total DDT in eggs ranged from 0.32 to 102 ppm with DDE as the most prominent compound. Lindane concentrations were much lower. Eggs from the test areas contained higher residues than those from unsprayed habitats. There was no significant correlation between DDT levels and start of egg laying. A possible effect on hatching time was observed in the great tit. Clutch sizes were similar in the test and reference areas. In the great tit and the glue tit, percentages of eggs which failed to hatch tended to be higher in the orchards than in reference areas. High population density may have been a factor as well as pesticides. An increase in nestling mortality was observed in the pied flycatcher, probably due to a food shortage. The densities of breeding pairs, the reproduction rates, and breeding success were similar to those observed in other studies in what were probably uncontaminated areas.

73-0339. Bejer-Petersen, B.; Hermansen, R. R.; Weihe, M. (Zoological Inst., Forest Zoology, Royal Vet. and Agr. Univ., Buelowsvej 13, Charlottenlund, Denmark). **On the effects of insecticide sprayings in forests on birds living in nest boxes.** *Dan. Ornithol. Foren. Tidsskr. 66(1,2): 30-50; 1972.* (25 references)

The effects of spraying forest areas with various insecticides on the three most prevalent birds (*Parus major, Parus ater,* and *Ficedula hypoleuca*) breeding in nesting boxes were investigated from 1965 to 1968. Spraying was carried out in 1965 and in 1967 at a time when *Parus* nestlings were most numerous. After parathion spraying, the breeding success of *Ficedula hypoleuca* was 50% compared to 64-100% in control areas, and the loss of *Parus* nestlings was significantly affected. Residues in these birds ranged from traces to 11 ppm. Malathion did not significantly affect breeding success or loss of nestlings. In one or two of the broods of each species, reduced brain ChE activity was observed. On one-third of the DDT-treated plots the breeding success of *P. major* was significantly lower than that of the control area and the loss of nestlings was significantly higher. Residues in dead nestlings ranged from 0.10 to 2.8 ppm DDT and from 0.22 to 0.37 ppm DDE. No effects and no detectable residues were observed in lindane-treated plots. Insecticidal sprayings apparently had no influence on bird populations in the years following application.

73-0340. Rakhmatullayeva, M. D. (Author address not given). **Scientific and practical conference on the protection of the population's health, in connection with the extensive use of pesticides in Uzbekistan.** *Hyg. Sanit. 36(4): 151-152; 1971.*

English translation; for an abstract of the original Russian article, *Gig. Sanit.* 36(4): 115-116; 1971, see Abstract no. 72-0677.

73-0341. Matokhnyuk, L. A. (Kiev Occup. Health Res. Inst., Kiev, USSR). **Toxicity of the fungicide maneb on inhalation.** *Hyg. Sanit. 36(5): 195-199; 1971.* (11 refer-

English translation; for an abstract of the original Russian article, *Gig. Sanit.* 36(5): 22-26; 1971, see Abstract no. 72-0753.

73-0342. Namba, T. (Maimonides Med. Cent., State Univ. of New York, Downstate Med. Cent., Brooklyn, NY). **Diagnosis and treatment of organophosphate insecticide poisoning.** *Med. Times (Port Wash., NY) 100(6): 100-126; 1972.*

Diagnosis of organophosphate poisoning depends partially on measurement of serum ChE activity, which is an indication of the AChE activity at the cholinergic synapse where organophosphates produce their toxic effect. In mild poisoning recovery of serum ChE takes about 2 wk while clinical signs disappear in 24 hr. Although organophosphates do not accumulate in the body, the effects of repeated exposure accumulate as decreased tissue ChE activity or detoxifying activity. In manifest poisoning serum ChE is < 50% of normal. In moderate cases patients are generally unable to walk, and in severe poisoning there is a disturbance of consciousness. Miosis occurs in about half the patients and is used as an indicator of effectiveness of treatment. A number of other symptoms can be used to determine the severity of poisoning. A characteristic garlic odor remains with the patient several days after ingestion. Combined use of pralidoxime and atropine sulfate is the most effective treatment of poisoning. Pralidoxime is effective in parathion, methyl parathion, EPN, diazinon, and probably, dicrotophos, carbophenothion, dichlorvos, dimethoate, and mevinphos poisoning.

73-0343. Inkyo, K.; Mori, Y.; Daimatsu, E.; Oshino, E.; Mizuno, K.; Inagaki, K.; Takahashi, N.; Makino, T.; Nishi, M. (Matsuto Health Cent., Ishikawa Prefect., Japan). **[On the relation between anemia in rural women and their diets and usage of agricultural chemicals.]** *Nippon Koshu Eisei Zasshi (Jap. J. Pub. Health) 19(10): 265; 1972.* (Japanese)

Anemia in 600 rural women was studied from June to October 1971, relative to amount of hemoglobin, hematocrit value and specific gravity of whole blood; the criterion of anemia was hemoglobin less than 11.9 g/dl. The dietal information was obtained by question and answer concerning the frequency of consumption of major food groups and the food eaten the day before the examination and by the calculation of major nutrients from the answers. Previous results of investigations indicated a clear relationship between the incidence of anemia and the number of agricultural chemical applications. No such relationship was found in the present study.

73-0344. Matsushima, S. (Japan Inst. of Rural Med., Usuda, Nagano Prefect., Japan). **[On disturbances of the nervous system induced by organophosphorus pesticides.]** *Nippon Noson Igakkai Zasshi (J. Jap. Ass. Rural Med.) 21(2): 94-95; 1972.* (Japanese)

Three chronic cases of disturbances of the nervous system supposedly induced by fenitrothion are reported. The three males, ages 21, 25, and 29, were employed by pest control companies and had recently applied a pesticidal oil formulation containing fenitrothion. The length of application was 2-3 hr, sometimes extending to 8 hr, without a protective mask. The subjective symptoms began three months after the commencement of pesticide application and included general malaise, fatigability, anorexia, nausea, lethargy, thirst, and loss of weight. Other complaints were headache, loss of memory, and impaired thinking. No anomalies were observed as results of detailed hematological, biochemical, urine, chest roentgenographic, electrocardiographical, and ophthalmological examinations except one case of proteinuria with CCLF(+). EEG and serum ChE were normal (0.99-1.11 ΔpH).

73-0345. Kato, S. (Shinshu Univ., Nagano Prefect., Japan). **[Relation between organophosphorus pesticides and ocular anomalies.]** *Nippon Noson Igakkai Zasshi (J. Jap. Ass. Rural Med.) 21(2): 96-97; 1972.* (Japanese)

The diagnostic standards for ocular anomalies attributed to organophosphorus pesticides were submitted by a research group of the Ministry of Public Welfare. The standards included: impaired vision (fluctuating) less than 1.0 after correction; visual field stenosis less than 40 nasal and less than 60 temporal; progressive myopia; serious astigmatism, difference between horizontal and vertical larger than 2.0 D; standing time on one leg less than 5 sec; PAM or Padrin effective in therapy; lowered ChE activity; edema and atrophy of optic nerve, pale in color on temporal side. According to the recent investigation on a large number of school boys, the relationship between the above symptoms and organophosphorus pesticides was so obscure as to be almost irrelevant. Except in acute intoxication, it is very difficult to diagnose clinical symptoms for chronic intoxication; the present study found no results.

73-0346. Hazeltine, W. (26 Rosita Way, Oroville, CA 95965). **Disagreements on why brown pelican eggs are thin.** *Nature (London) 239(5372): 410-411; 1972.* (8 references)

Evidence is presented to refute the proposal that DDE was the cause of thin eggshells in brown pelicans. Data from three colonies composed of two subspecies were used in the study under discussion and none of the separate colonies gave proof. Values were extremely variable; whole egg analysis was inappropriate since yolk contents are subject to metabolic changes during incubation. Non-parametric statistics should have been used on the values which were not bi-variantly normally distributed. Of the other eggs collected with those of the published study, the ones with the thicker shell were from a female with high DDE residues. When DDE residues were expressed on a lipid basis, a correlation was obtained with shell thickness. High-residue eggs had thicker shells.

73-0347. Moriyama, I.; Ichikawa, H.; Ide, H. (Saku Gen. Hospital, Usuda, Nagano Prefect., Japan). **[Death after accidental ingestion of gramoxone resulting in fibrosis of the lung.]** *Nippon Noson Igakkai Zasshi (J. Jap. Ass. Rural Med.) 21(2): 244-245; 1972.* (Japanese)

The death of a 68 year-old wife of a farmer 25 days after accidentally ingesting 5 ml of gramoxone (paraquat) is reported. The herbicide had been in an old vinegar bottle used when cooking. Subjective symptoms appeared a few hours later as nausea, vomiting, and diarrhea. Nausea continued accompanied by dizziness. The woman was hospitalized five days later with coughing, excessive thirst, and vertigo. Symptoms included coated tongue, redness in larynx, slight edema of legs, and no rales. After hospitalization funicular and reticular shadows appeared on chest roentgenographs of lower lungs. Dry cough and dyspnea increased. Funicular shadow increased and spread upwards. Small bubbling rales became noticeable. Because of a suspicious fibrosis in the lung, steroid was administered seven days after hospitalization. Azotemia was improved by fluid supplementation; however, the respiration slowly became shallow and more frequent with rapid pulse. The patient died suddenly from respiratory arrest two weeks later. Roentgenographs showed progressive funicular and reticular shadows. Autopsy revealed diffuse fibrosis with bleeding, especially noticeable in lower part, pseudomembranous colitis, acute subarachnoid edema, toxic nephrosis, congestion of lobules of the liver, erosion of mucous membrane in esophagus, and dissolution of zone fasciculata of adrenal cortex.

73-0348. Hashida, K. (Dr. Hiraki School of Intern. Med., Fac. of Med., Okayama Univ., Okayama, Japan). **[Studies of organofluorine pesticide intoxication. II. Results of health examinations of farmers using an organofluorine pesticide.]** *Okayama Igakkai Zasshi (J. Okayama Med. Soc.) 83(7-8): 295-310; 1971.* (43 references) (Japanese)

A health survey was carried out on 181 farmers before and after the pesticidal application of Nissol (MNFA). Questionnaires on general health, determination of blood pressure and body weight, examination of urine and liver functions, physical examinations, indirect chest roentgenography, blood picture, blood sugar level, and ECG were recorded for some farmers. Forty-five percent of the farmers complained of subjective symptoms at the second examination (4 days after the application), unrelated to the duration of working hours. The major subjective symptoms were general malaise, headache, nausea, loss of appetite, diarrhea, insomnia, abdominal pain, and tachypnea in that order. On the average, body weight loss appeared in 33.6% of the farmers three weeks after the application. Hemoglobin increased in 4.6%, decreased in 18.7%, and did not change in 77% of the farmers. Red cell count decreased in about 52% of the farmers. Leukocyte count increased in less than fifty percent of the farmers with a noticeable increase of neutrophils. Some increase of urobilinogen and glycosuria were noticed while proteinuria remained stable. Clinically questionable findings were not obtained in liver functions. The findings on ECG were a slight decrease of heart rate and a slight elongation of PQ; however, no arrhythmia was found.

73-0349. Jensen, N. E. (Royal Victoria Hospital, Shelley Rd., Bournemouth, Hampshire, England). **Chloracne: three cases.** *Proc. Roy. Soc. Med. 65(8): 687-688; 1972.* (5 references)

Three cases of chloracne, believed to be caused by traces of tetrachlorodibenzodioxane formed when an explosion occurred during the production of 2,4,5-T, are reported. Two of the patients had been temporarily employed fitting pipes on salvaged equipment which had been cleaned by high pressure steam jets almost three years after the explosion. The third was a child exposed to one of the pipe-fitters in his work clothes. Acute erythema appeared on the face, followed by creamy colored cystic lesions and later comedones of chloracne. Folliculitis and comedones were present on the trunk and proximal limbs. There was no pruritus or history of acne. Eleven months after the time of exposure, the wife of one patient developed facial comedones. One of the three cases improved in 11 months although original cases had remained severe for 12 to 18 months after the explosion.

73-0350. Parsons, J. K.; Davis, B. D. (Texas Parks and Wildl. Dept., San Angelo, TX). **The effects on quail, migratory birds, and non-game birds from application of malathion and other insecticides.** *Tech. Series No. 8, Texas Parks and Wildl. Dept., 1971, pp. 1-20.* (10 references)

The short-term effects of aerial spraying of malathion and azinphosmethyl on game and non-game birds using cover or prairie lakes adjacent to cotton fields were observed during a 5-yr boll weevil control program. No dead birds or other evidence of immediate detrimental effects were observed on any of the land or water areas sprayed with 12 and 16 fl oz of either insecticide per acre. Caged quail, which were exposed to each spray period in the field and were fed sprayed feed, exhibited non-significant differences in growth rates between control and treated birds.

73-0351. Martynov, A. A. (Therapeutical Dept., Kuusinen State Univ., Petrozavodsk, USSR). **K klinike i lecheniyu otravleniy khlorofosom. [On the clinical picture and the treatment of poisonings with trichlorfon.]** *Uch. Zap. Petrozavodsk. Gos. Univ. 17(5): 136-139; 1970.* (4 references) (Russian)

The clinical picture of acute poisoning with trichlorfon is established from 12 cases and the treatment of such cases described. Respiratory troubles due to the hypersecretion of the bronchial glands and to the paralysis of the respiratory muscles and motor disorders are the main symptoms of acute poisoning. An increased acetylcholine level induces serious damage of the CNS with coma lasting over many hours or days. Sinus tachycardia, moderate hypertension, hypersalivation, nausea, vomiting, convulsive gastric pains, diarrhea in many cases, involuntary urination and defecation, hematuria, temporary leukocytosis, tendency to aneosinophilia and

lymphocytopenia, and subfebrile condition during the first 1-2 days were observed. Atropine doses of 5-40 ml/h, glucose and physiological saline solution with vitamins C and B1 as well as with antihistamine preparation were administered, and oxygen therapy applied, depending on the seriousness of the poisoning.

73-0352. Yelizarov, G. P. (Clinical Dept., Gorki Scientific Res. Inst. of Occup. Hyg. and Occup. Dis., Gorki, USSR). **Professional'nyye zabolevaniya kozhi, vyzvannyye simazinom i propazinom. [Occupational skin diseases caused by simazine and propazine.]** *Vestn. Dermatol. Venerol. 46(2): 27-29; 1972.* (4 references) (Russian)

Observations on 124 cases of occupational skin diseases caused by simazine and propazine in workers of pesticide manufacturing plants are summarized. The skin diseases observed ranged from subacute to acute contact dermatitis. Pale pink erythema and slight edema of the skin, lasting 3-4 days, were observed in subacute cases. Serious dermatitis, erythema and edema, a great number of small vesiculopapular elements which sometimes produced dermatitis bullosa, were the symptoms of acute cases and lasted 7-10 days.

73-0353. Aleyeva, L. V.; Galaka, B. A.; Fedorenko, A. P.; Shevchenko, L. S. (All-Union Res. Inst. of Hyg. and Toxicol. of Pestic., Polymers and Plastics, Kiev, USSR). **O vliyanii yadokhimikatov na razmnozheniye zaytsa-rusaka (*Lepus europaeus Pallas*). [On the effect of agricultural chemicals on reproduction of hares, *Lepus europaeus* Pallas.]** *Vestn. Zool. 6(2): 58-61; 1972.* (4 references) (Russian)

Comparative investigation of DDT residues in and effects on the reproduction of two different populations of *Lepus europaeus* Pall. living in different regions with high and low DDT contamination levels is described. Hares from the region where DDT was used extensively had a male-to-female ratio of 1:2.2, a maximum yearly population growth of 43.6%, and a maximum yearly litter increase of 1.1 per female. The DDT residue contents in the lung, kidney, muscles, brain, and gonads of such hares were 2.5, 6.6, 4.3, 21.0, and 23.0 mg/kg, respectively. Seriously damaged spermatogenesis and ovogenesis, nucleolysis in the ovocytes, pathological alteration of the embryonal epithelium, reduced sex hormone levels in the urine, and increased gonadotrophic activity in hares whose gonads contained more than 20 mg of DDT per kg were observed. Reduced fertility and retarded development of the young were also noticed. Hares from another region where the use of DDT was restricted had a male-to-female ratio of 1:1.6, a maximum yearly population growth of 78.5%, and a maximum annual litter increase of 6.0 per female. The DDT residues in the lung, kidney, muscles, brain, and gonads of such hares were 1.4, 1.8, 1.4, 2.7, and 4.3 mg/kg, respectively. The differences in the reproduction of the two populations are due to those in the intensity of the use of DDT.

See also **73-0260** **73-0262** **73-0400** **73-0402** **73-0496**

73-0354. Dobryanskiy, V. M. (All-Union Res. Inst. of Hyg. and Toxicol. of Pestic., Polymers and Plastics, Kiev, USSR). **Toksikologicheskaya kharakteristika limatsida metal'degida. [Toxicologic characteristics of the molluscicide metaldehyde.]** *Zdravookhraneniye 18(3): 13-16; 1972.* (Russian)

Acute and chronic toxicity, dermal absorption, and local irritating effects of the molluscicide, metaldehyde, were studied in animal tests. The oral LD50 values, determined by administration through gastric tube, were 175 mg/kg in guinea pig, 200 mg/kg in white mice, 227 mg/kg in white rats, and 290 mg/kg in rabbits. Such doses induced clonic-tonic spasms, opisthotonos, paralysis of the limbs, respiratory troubles and arrhythmia, dyspnea, cyanosis of oral mucosa, and death within 4-5, but not later than 24 hr. Surviving animals normalized within two days after poisoning. The maximum tolerable doses (50 mg/kg in guinea pigs, white mice, rats and 100 mg/kg in rabbits) caused irritability, and increased sensitivity to pressure and pain. The cumulation coefficient determined in white mice and rats treated with 1/10 to 1/100 LD50 was low with 5.4-5.75. Low rate of dermal absorption was determined with an LD50 value of 2,275 mg/kg in rats. Local irritation only of the eye mucosa was observed. The results indicate that metaldehyde has high toxicity and small cumulation, and primarily damages the central and peripheral nervous systems in acute poisoning.

73-0355. Sadykov, R. E.; Rabochev, V. K.; Strokov, Yu. N. (Kirghiz Res. Inst. of Livestock-Farming and Veterinary, USSR). **Vliyaniye obrabotki pastbishch butilovym efirom (2,4-DB) na vosproizvoditel'nyye funktsii ovets. [The effect 2,4-DB used for the treatment of pastures on the reproductive function of sheep.]** *Zhivotnovodstvo 34(2): 73-74; 1972.* (Russian)

The effect of 2,4-DB on the reproductive function of sheep driven out to a pasture 72, 144, and 288 h after the latter was treated with 3 kg of 2,4-DB per ha was studied. The sheep, preferring killed weeds to intact grass, had temperature increases of 0.4-0.5 C, asthenia, and leukocytosis during the first four days on the pasture. Ewes fertilized with sperms from intact males had normal fertility, but they had increased rate of stillbirth (3.7-10.7% against zero in the control group). Fetal mummification and retarded development of the lambs were observed. No teratogenic effect of 2,4-DB was detected. Males kept on the 2,4-DB-treated pasture showed reduced sexual activity and impairment in the sperm quality. The results indicate that livestock should be kept off 2,4-DB-treated pastures for 20 days after application and that this period should be extended to 45 days for sucklings.

73-0356. Ivanayevskiy, V. S.; Ardatova, A. N.; Peloz, D. D. (All-Union Res. Inst. of Exp. Vet. Med., USSR). **O toksichnosti myasa zhivotnykh pri otravlenii ikh Granozanom. [On the toxicity of the meat of Granosan-poisoned animals.]** *Zhivotnovodstvo 34(4): 54-55; 1972.* (Russian)

The risks involved in feeding the meat of animals emergency-slaughtered or dead due to pesticide poisoning to other animals were studied in puppies and kittens fed veal (50 g/kg day) containing mercury residues of 1.29-1.40 mg%. The puppies developed clinical symptoms of mercury poisoning after 20-25 days (loss of appetite, asthenia, depression, clonic-tonic spasms, disturbed coordination, aggressiveness, paralysis of the hind legs, tactile hypersensitivity, and loss of sight, hearing, scent, and taste). The animals died between the 25th and 23rd days in comatose state. Except for the hyperemia of the meninges, no pathoanatomical alterations were detected. The mercury residues in the liver, kidney, muscles, and cerebrum were 4.5, 4.2, 1.4, and 0.8 mg%, respectively. The kittens fed the same food developed clinical symptoms after 16-18 days (loss of appetite, depression, ataxia, tonic spasms and paralysis of the hind legs due to the damaged central nervous system, loss of sight, and tactile hypersensitivity). The animals died between the 18th and 32nd days of the experiment without showing pathoanatomical changes. The mercury residue levels in the liver, kidney, muscles, and cerebrum were 2.34, 0.83, 0.69, and 1.07 mg%, respectively.

73-0357. Tokareva, T. G.; Turov, I. S.; Alekseyev, A. N. (Moscow Central Hyg. Inst., Moscow, USSR). **Deystviye ftoratsetamida na plodovitost' belykh myshey (predvaritel'noye soobshcheniye). [The action of fluoroacetamide on albino mouse fecunidty (preliminary report).]** *Zh. Mikrobiol. Epidemiol. Immunobiol. 48: 24-26; 1971.* (8 references) (Russian)

The effects of single sublethal oral doses of fluoroacetamide (15 mg/kg in 0.03% aqueous solution), administered to female white mice 2 days before or 10 days after fertilization, were studied on the embryonal and postnatal development. The fluoroacetamide influenced the ovulation and the viability of the ovi (later the embryonic and the postnatal development) which led to increased prenatal mortality, to prolongation of the pregnancy, and reduced viability of the neonates. Females treated 10 days after fertilization showed the greatest increase (by up to 30 days) in the duration of pregnancy while embryonic mortality was highest in the group treated two days before fertilization (11.7% against a control value of 4.6%). Reduced body weight, cyanosis, respiratory distress, and decreased motility were among the anomalies observed in neonates in the test groups.

73-0358. Kudo, N. (Kudo Hosp. of Intern. Med., Hirosaki, Japan). **[Reexamination of clinical aspects and diagnosis of chronic intoxication by organophosphate pesticides.]** *Nippon Noson Igakkai Zasshi (J. Jap. Ass. Rural Med.) 21(2): 92-93; 1972.* (Japanese)

As part of a continuing study on chronic organophosphate poisoning in agricultural regions, serum cholinesterase (ChE) determinations were performed on 2490 agricultural workers in Hirosaki, Japan. The workers also filled out questionnaires relating to history of pesticide exposure and presence of symptoms indicating organophosphate effects. Out of 316 persons found to have serum ChE activities of less than 0.6 ΔpH, 262 were studied in greater detail, with liver function tests and clinical examinations. The results indicated the presence of chronic organophosphate intoxication in 26 cases, mostly involving women above 30 years of age. The principal symptoms were fatigue, dizziness, loss of visual acuity, and numbness of extremities. Liver function was normal in 96%. The erythrocyte ChE activity in these 26 patients averaged 0.28 ΔpH, compared to 0.52 in a healthy population. The erythrocyte ChE value of 0.41 ΔpH in patients with serum ChE levels below 0.51 ΔpH was significantly lower than in healthy persons. The serum ChE activity was not significantly correlated with the occurrence of organophosphate poisoning. Determination of the erythrocyte/total ChE ratio might be useful in mass surveys.

73-0359. Johansson, J. O.; Kihlstroem, J. E.; Lundberg, C. (Inst. of Zoophysiol., Univ. of Uppsala, Sweden). **Administration of DDT and PCB prolongs oestrous cycle in mice.** *Ambio 1(4): 148-149; 1972.* (14 references)

Single injections of DDT (40 mg/kg) or polychlorinated biphenyls (PCB) (20 mg/kg) prolonged the length of the estrous cycle in mice. The mean length was increased by about half a day with DDT and over 1 day with PCB. The lengths returned to normal after three cycles. An effect on the catabolism of steroid hormones was believed responsible for the prolongation. This effect combined with other effects on reproduction by organochlorines could cause a decline in the reproductive capacity of the animals.

73-0360. Fowler, B. A. (Nat. Inst. of Environ. Health Sci., Pathol. Physiol. Branch, Box 12233, Research Triangle Park, NC 27709). **The morphologic effects of dieldrin and methyl mercuric chloride on pars recta segments of rat kidney proximal tubules.** *Amer. J. Pathol. 69(1): 163-178; 1972.* (67 references)

Ultrastructural alterations in the proximal tubules of the kidney were observed in rats fed diet containing dieldrin (5.0 ppm), methyl mercuric chloride, and the combination of both. These alterations did not become more severe with prolonged exposure. Most marked morphologic effects were seen in the pars recta; the response was greater in females than in males. An increase in smooth endoplasmic reticulum (SER) was found with either compound. In addition pars recta tubules of female animals treated with methyl mercuric chloride were dilated and contained many spherical hematoxylin-positive staining cytoplasmic masses visible by light microscopy and electron-dense membranous cytosomes. Sexual differences in response may be explained by differences in renal enzyme levels or activities. Administration of both compounds simultaneously seemed to result in less cellular change than when either compound was given alone although increased amounts of SER and more degeneration in tubule cells were observed in the former case.

73-0361. Dickinson, J. O. (Dept. of Vet. Physiol. and Pharmacol., College of Vet. Med., Washington State Univ., Pullman, WA 99163). **Toxicity of the arsenical herbicide monosodium acid methanearsonate in cattle.** *Amer. J. Vet. Res. 33(9): 1889-1892; 1972.* (4 references)

Total oral doses of 80 to 100 mg/kg (10 mg/kg/day) of monosodium acid methanearsonate (MSMA) in an aqueous preparation were fatal to 4 of 5 treated cattle. Toxicity was about the same with an aqueous preparation containing a dye and some other ingredients. Renal failure was apparently the cause of death even in animals that died after withdrawal of treatment although renal arsenic levels decreased when the compound was not administered. Residues of up to 64 ppm arsenic in kidney and as low as 27 ppm in liver were found. All treated cattle exhibited toxic nephrosis and hemorrhagic gastritis. Lesions in liver varied.

73-0362. Gagne, J.; Brodeur, J. (Dept. of Pharmacol., Fac. of Med., Univ. of Montreal, Montreal, Quebec, Canada). **Metabolic studies on the mechanisms of increased susceptibility of weanling rats to parathion.** *Can. J. Physiol. Pharmacol. 59(9): 902-915; 1972.* (20 references)

Equitoxic doses of ^{32}P-parathion (1.5 mg/kg in weanlings of both sexes, 2.0 mg/kg in adult females, and 3.1 mg/kg in adult males) were given by the intravenous route to immature and adult rats in order to investigate the respective contribution of biotransformation, distribution, and excretion phenomena to the increased susceptibility of weanling rats to the acute toxic effects of parathion. At various intervals the animals were sacrificed and the amounts of parathion, paraoxon, diethylphosphorothioic acid, and diethylphosphoric acid in the liver, kidneys, tibial muscle, plasma, brain, adipose tissue, and urine were determined. In vitro metabolism of ^{32}P-parathion by liver homogenates was also investigated. The results obtained suggest that weanlings are more susceptible to parathion than adults mainly because of deficient hepatic mechanisms for degradation of parathion and its toxic metabolite, paraoxon. In addition, the brain tissue of weanlings appears to be more sensitive to the toxic effects of paraoxon than the brain of male adults. On the other hand, the passage of parathion and paraoxon across the blood-brain barrier does not seem to be facilitated in weanlings by comparison with adults. Finally, there is no evidence that the renal handling of parathion and its metabolites might

influence the acute toxicity of parathion in weanling and adult rats. (Author abstract by permission)

73-0363. Aulerich, R. J.; Ringer, R. K.; Polin, D. (Fur Animal Project, Poultry Sci. Dept., Michigan State Univ., East Lansing, MI). **Rate of accumulation of chlorinated hydrocarbon pesticide residues in adipose tissue of mink.** *Can. J. Zool. 50(9): 1167-1173; 1972.* (7 references)

Dieldrin, DDT (1,1,1-trichloro-2,2-bis(*p*-chlorophenyl)ethane), and DDD (TDE) (1,1-dichloro-2,2-bis(*p*-chlorophenyl)ethane) were fed to mink to ascertain the rate of accumulation and isomeric distribution of the residues in adipose tissue. Activated carbon was incorporated into the rations in an attempt to reduce the rate of pesticide residue accumulation. Adipose tissue samples, procured biweekly by biopsy, were analyzed by gas chromatography for pesticide residues. Mink fed 100 ppm DDT plus 50 ppm DDD had tissue pesticide levels averaging 373 ppm by the 2nd week of feeding and 510 ppm by the 4th week. Control tissues averaged from 5 to 23 ppm DDT and its isomers. In control tissues the three isomers DDT, DDD, and DDE (1,1-dichloro-2,2-bis(*p*-chlorophenyl)ethane) accounted for 59, 15, and 26%, respectively, of the total concentration. In samples from treated mink, the relative concentration of DDT, DDD, and DDE was 74, 23, and 3%, respectively, of the total level. The dieldrin content of tissues from mink fed 2.5 ppm dieldrin plateaued at about 21 ppm in 4 weeks. Activated carbon in the diet at 4410 ppm did not influence the rate of pesticide accumulation in the fat, the level at which the pesticide residues tended to plateau, or the distribution of DDT and its isomers. (Author abstract by permission)

73-0364. Nelson, D. L.; Crawford, C. R. (Toxicol. Sect., Chemagro Div. of Baychem Corporation, Kansas City, MO). **Organophosphorus compounds: the past and the future.** *Clin. Toxicol. 5(2): 223-230; 1972.* (20 references)

A general review of the organophosphates indicates that because of their systemic activity, selectivity, and rapid breakdown they will be desirable tools for pest control. Comparison of LD50s in rats indicates that Dasanit, Demeton, and disulfoton are among the most toxic. Some act on AChE while others only inhibit pseudo-cholinesterase which hydrolyzes ACh only when tissue levels are elevated. Most common symptoms of intoxication are nausea, salivation, diarrhea, muscle fasciculations, abdominal pain, and bradycardia. If death occurs, it is a result of respiratory failure and reduced blood pressure. The organophosphates are generally metabolized in the body, probably by nonspecific esterases and oxidative microsomal enzymes, and different compounds are metabolized in different ways in various animals. Organophosphates are also hydrolyzed and further degraded in the environment. A few of the compounds in pairs exhibit potentiated activity due to the blocking by one compound of the enzyme systems that normally metabolize the other. Subacute exposure has led to tolerance in rats and to delayed neurotoxicity in other animals. Intoxication in man has generally resulted from poor handling, attempted suicide, or accidental ingestion. Atropinization is the best treatment for organophosphate poisoning. 2-PAM is sometimes used in conjunction with atropine to reactivate AChE.

73-0365. Holmberg, B.; Jensen, S.; Larsson, A.; Lewander, K.; Olsson, M. (Nat. Board of Fisheries, Goteborg, Sweden). **Metabolic effects of technical pentachlorophenol (PCP) on the eel *Anguilla anguilla* L.** *Comp. Biochem. Physiol. 43(1B): 171-183; 1972.* (24 references)

Eels (*Anguilla anguilla* L.) were exposed to sea water and fresh water containing 0.1 ppm pentachlorophenol (PCP). The accumulation of the pesticide as well as the effects on different metabolites in blood, muscle, and liver were studied. PCP exposure caused changes which indicated a hypermetabolic state with accelerated utilization of tissue energy reserves. An altered cholesterol metabolism, a decreased activity of liver glutamate pyruvate transaminase (GPT), and an enlargement of the liver suggested a disturbed liver function. The effects of PCP seemed to persist in spite of a recovery period in clean water for about two months. (Author abstract by permission)

73-0366. Sobotka, T. J.; Brodie, R. E.; Cook, M. P. (Div. of Pestic. Chem. and Toxicol., Food and Drug Admin., Washington, DC). **Behavioral and neuroendocrine effects in rats of postnatal exposure to low dietary levels of maneb.** *Develop. Psychobiol. 5(2): 137-148; 1972.* (30 references)

Several behavioral and neurochemical responses were investigated in three groups of rats following exposure to maneb. The rats received maneb through milk of dams during the neonatal period or at dietary levels of 0.5, 1.0, and 10.0 ppm after weaning or in both. No appreciable changes in adult body wt, thyroid or brain part wt, or weanling body wt of male rats were seen in any group. Exposed male weanlings (30 days old) exhibited a reduced degree of exploration in the open-field test, significant at the 10 ppm level. A maneb-related reduction in exploratory activity in a novel environment (passive avoidance test) was also observed in weanlings. Operant conditioning procedures indicated that neonatal and lifetime exposure improved learning ability of the rats as adults. The learning scores of the second group were not significantly different from those of controls. At the end of six mo, elevated plasma levels of corticosterone were noted in the second group given maneb diets of 0.5 and 10 ppm. The third group was not affected, but a similar trend was observed in the first group. Maneb at the 10 ppm level significantly reduced ChE activities in all three brain parts examined. The reduction was lower in rats of the third group.

73-0367. Casper, H. H. (North Dakota State Univ., Fargo, ND). **Gastric absorption of 1-naphthyl *N*-methylcarbamate (carbaryl) in the fasted rat.** *Diss. Abstr. Int. 32(11): 6599B; 1972.*

The rate, region, and route (lymph vs. blood) of absorption of 1-naphthyl *N*-methyl(carbamate-^{14}C) administered intragastrically (7.5 μmoles/kg body wt) to fasted female rats were estimated. In 24 hours 83.95 ± 3.56% (n=4) of the ^{14}C was absorbed by intact rats, whereas 56.15 ± 8.08% (n=3) of the ^{14}C was absorbed when passage into the intestine was blocked by ligation of the pylorus. The results of measurements of time vs. $^{14}CO_2$ expiration indicated a rapid absorption and metabolism of the ^{14}C, probably by the stomach or cranial small intestine. Total ^{14}C recoveries in the lymph from the thoracic lymph duct and ^{14}C concentrations in the portal blood indicated that the blood was the major route of ^{14}C absorption. The gastric absorption of (1-naphthyl-1-^{14}C)*N*-methylcarbamate administered intragastrically (7.5 μmoles/kg body wt) to fasted, anesthetized female rats was also characterized. In 22 and 67 minutes 52.6 ± 14.1% (n=3) and 81.7 ± 15.7% (n=3), respectively, of the ^{14}C was absorbed from the stomachs (ligated pylorus) of rats with intact gastrointestinal circulation. In another study 69.1 ± 25.9% (n=3) of the ^{14}C was absorbed from rat stomachs (ligated pylorus and esophagus) during 66.0 ± 1.0 minutes of total portal blood collection (via an in vivo perfusion technique). The ^{14}C-material in the collected portal blood accounted for 97.2 ± 1.9% (n=3) of the ^{14}C absorbed from the rat stomachs. On the basis of thin layer chromatography, gas chromatography, and infrared spectroscopy, 89.3% of the ^{14}C-material in the collected portal blood was (1-naphthyl-1-^{14}C) *N*-methylcarbamate. (Author abstract by permission. Copies of the thesis are available from University Microfilms, order No. 72-16,027)

73-0368. Fouts, J. R. (Pharmacol. and Toxicol. Branch, Nat. Inst. of Environ. Health Sci., Nat. Inst. of Health, Box 12233 Research Triangle Park, NC 27707). **Some studies and comments on hepatic and extrahepatic microsomal toxication-detoxication systems.** *Environ. Health Perspect. 2: 55-56; 1972.* (45 references)

Three topics pertinent to "drug metabolism" and environmental health science are discussed: extrahepatic toxication-detoxication systems; age-dependent changes in toxication-detoxication systems in lung vs. liver; and species-strain-invididual differences in "induction" of hepatic toxication-detoxication systems by the pollutants benzpyrene and DDT. The two classes of hepatic drug-metabolizing enzyme inducers, benzpyrene or 3-methylcholanthrene types and phenobarbital or DDT types are influenced by genetic and environmental factors and have been thoroughly studied. DDT elevates most of the toxication-detoxication systems in liver microsomes, but the stimulation is evident later than with benzpyrene. DDT usually induces massive proliferation of parenchymal cell smooth endoplasmic reticulum and promotes the formation of more P 450; benzpyrene does not. A spectrally different P 450 is induced. Swiss-Webster mice responded only slightly to DDT and not at all to benzpyrene. A wider recognition of the heterogeneity of these systems and their responses is needed.

73-0369. Bajgar, J.; Jakl, A.; Hrdina, V. (Purkyne Med. Res. Inst., Hradec Kralove, Czechoslovakia). **The influence of obidoxime on acetylcholinesterase activity in different parts of the mouse brain following isopropylmethyl phosphonofluoridate intoxication.** *Eur. J. Pharmacol. 19(2): 199-202; 1972.* (18 references)

AChE activity was reduced by sarin (0.4 mg/kg, im) to 3-20% of control levels in four parts of mouse brain, the highest inhibition being observed in the ponto-medullary region. Increasing doses of obidoxime, administered with a constant dose of atropine sulfate, significantly elevated AChE levels in the ponto-medullar area of brains of mice poisoned with sarin. A non-significant increase was observed in the basal ganglia. Mortality correlated with AChE activity in the ponto-medullar part and was decreased by increasing the dose of obidoxime. The highest dose used, 35 mg/kg, had the best therapeutic effect. Reactivation rather than prevention, appears to be obidoxime's mode of action.

73-0370. Rosenkranz, H. S.; Rosenkranz, S. (Dept. of Microbiol., Coll. of Physicians and Surgeons, Columbia Univ., New York, NY 10032). **Reaction of DNA with phosphoric acid esters: gasoline additive and insecticides.** *Experientia 28(4): 386-387; 1972.* (8 references)

The reported mutagenic and carcinogenic properties of organophosphate compounds in some experimental setups may be due to an effect of these compounds on cellular DNA, or, more specifically, to alkylation of DNA. Incubation of DNA solutions with trimethyl phosphate, dichlorvos, or trichlorfon resulted in decreases in the sedimentation coefficients of the biopolymers, presumably due to alkylation of DNA followed by some depurination and scission of the phosphodiester backbone. Heating the modified DNA resulted in a further decrease in the sedimentation coefficient. Exposure of deoxyguanosine to these three organophosphates yielded a product identified by chromatography and spectroscopy as 7-methyldeoxyguanosine. In view of the established relationship between ability of a substance to react with DNA and its potential for inducing such detrimental effects as fetal damage and cancer, widespread human contact with these substances deserves reconsideration.

73-0371. Clausen, J.; Konat, G. (Inst. of Hyg., Univ. of Copenhagen, DK-2200, Copenhagen, Denmark). **Enzymic and behavioural changes induced in mice fed polychlorinated biocides followed by starvation.** *Experientia 28(8): 902-903; 1972.* (13 references)

The liver weight, total protein in the cytoplasmic liver fraction, and the activity of the P-450 complex of the liver were investigated before and during total starvation in mice fed diets containing DDT or lindane. In fasting control animals, the total protein content in the cytoplasmic fraction of the liver was low. DDT and lindane increased the activity of the P-450 complex by 50% and 140% respectively. Lindane intoxication was severe, so that the animals in this group were unable to survive starvation. The fasting, DDT-treated mice displayed a further increase in the activity of the P-450 complex; the mortality rate was about 45%. At the end of the starvation period, these animals also displayed neurological disturbances with impairment of movement. (Author abstract by permission, translated)

73-0372. Arutyunyan, R. M.; Kuleshov, N. P. (Inst. of Med. Genetics of the Acad. of Med. Sci. of the USSR, Moscow, USSR). **Modifitsiruyushchiy effekt tsisteina pri indutsirovaniyi tioTEF khromosomnykh aberratsiy v kul'ture leykotsitov cheloveka. [Modification by cysteine of thioTEPA induced chromosome aberrations in cultured human leukocytes.]** *Genetika 8(4): 148-153; 1972.* (16 references) (Russian)

The effect of L-cysteine on the frequency of thioTEPA induced chromosomal aberrations in cultured human peripheral leukocytes was studied. Leukocyte cultures in the 28th hour of cultivation treated with 15 and 20 μg thioTEPA/ml for one hour at a cysteine concentration of 0.001*M* had decreased numbers of aberrant cells and chromosomal aberrations, whether cysteine was added before, during, or after the thioTEPA treatment. When cysteine was added to non-stimulated leukocyte cultures similarly treated, the same effects occurred. However, cysteine was not protective when added during or immediately after the introduction of the mutagen prior to cultivation. Chromatid type aberrations which were decreased by cysteine accounted for about 80% of all aberrations in both experiments. The data obtained indicate that the protective effect of cysteine is not due to its reaction with thioTEPA in the cell, but is connected with the functional state of the cell and with recovery processes.

73-0373. Shtenberg, A. I. (Nutrition Res. Inst., Acad. of Sci. USSR, Moscow, USSR). **Fon pitaniya i chuvstvitel'nost' organizma k toksicheskim veshchestvam. [Nutrition and the sensitivity of the organism to toxic substances.]** *Gig. Sanit. 37(6): 73-76; 1972.* (16 references) (Russian)

Animal tests on the effects of various unbalanced diets on the resistance of the organism against pesticides are reviewed. The oral LD50 doses of lindane, DDT, parathion, and captan in rats kept on a diet with 26% casein were 180, 290, 760, and 2,630% higher than in rats fed a diet with 3.5% casein. The LD50s of monuron, parathion, DDT, lindane, and malathion were lower (40-90%), and those of diazinon, chlordane, endosulfan, carbaryl, and endrin higher (110-160%) in rats fed normal laboratory food than in rats kept on a diet with 26% casein. Sharp increase in the sensitivity towards DDT and lindane was observed in rats fed diets containing 81% casein. Increased toxic, gonadotoxic, and allergenic effects of pesticides in chronic poisoning in animals fed low-protein diets and considerable influence of the protein quality were observed. Reduced resistance and life of the spermatozoa, and decrease in the gonadotrophic activity of the hypophysis and in the tributyrinase activity were noticed in male rats fed diets containing 9% protein and 50 μg/kg doses of carbaryl for 45 days.

73-0374. Ryazanova, R. A.; Druzhinina, V. A.; Nevstruyeva, V. V. (Erisman Scientific Res. Inst. of Hyg., Moscow, USSR). **Eksperimental'-nvye materialy k obosnovaniyu predel'no dopustimoy kontsentratsii tsineba v vozdukhe rabochikh pomeshcheniy. [Experimental data for substantiating the maximum permissible concentration of zineb in the air of working premises.]** *Gig. Sanit. 37(8): 42-45; 1972.* (3 references) (Russian)

The toxicity of zineb was studied on mice, rats, rabbits, and guinea pigs. Zineb applied on the skin was not locally irritating, but had possible resorptive effects, as judged from the decrease in blood protein, SH-group levels, and cholinesterase activity. Zineb concentrations of 200 and 20 mg/m^3 inhaled by test animals over five months reduced the cholinesterase activity and the SH-group level and altered the weight coefficients of the inner organs and the reproductive functions in another experiment. The retention of zineb by tissues, determined by ^{32}P-labeled preparation, was inversely proportional to the concentration applied. A dose of 25 mg introduced intratracheally caused proliferation of the pulmonary cells. A threshold concentration of 5 mg/m^3, and a maximum allowable workplace concentration of 0.5 mg/m^3 are recommended bearing in mind gonadotoxic and embryotoxic actions.

73-0375. Korolev, A. A.; Shigan, S. A.; Vitvitskaya, B. R. (1st Moscow I. M. Sechenov Med. Inst., Moscow, USSR). **Vliyaniye ozonirovaniya na antikholinesteraznuyu aktivnost nekotorykh fosfororganicheskikh pestitsidov. [The effect of ozonization on the anticholinesterase activity of some organophosphorus pesticides.]** *Gig. Sanit. 37(8): 99-101; 1972.* (3 references) (Russian)

Ozonization-produced changes in the anticholinesterase activity and toxicity of coumaphos, acetophos (acetoxon), and methylnitrophos (fenitrothion) were studied in animal and in vitro tests. Ozonized doses of 2,4, 8, and 12 mg/kg of coumaphos and of 5, 10, 15, and 20 mg/kg of methylnitrophos had 17-30% higher anticholinesterase effect than non-ozonized doses three hours after administration. The cholinesterase-inhibiting effect of ozonized 10, 20, and 30 mg/kg doses of acetophos was lower by 20-25% than that of non-

ozonized doses. An increase of 24-27% was determined in vitro in the anticholinesterase activity from methylnitrophos due to ozonization. The toxicity of non-ozonized 2.5 mg/kg doses of acetophos administered i.v. to rabbits was significantly higher than that of ozonized doses. The increased anticholinesterase activity and toxicity of ozonized coumaphos and methylnitrophos is due to the partial oxidation of phosphorus-sulfur bonds present in such compounds to phosphorus-oxygen bonds with the subsequent formation of a new compound with increased toxicity.

73-0376. Voytenko, G. A.; Kaminskaya, T. L.; Karpenko, V. N. (Kiev Res. Inst. of Occup. Hyg. and Occup. Diseases, Kiev, USSR). **Eksperimental'nyye dannyye k obosnovaniyu predel'no dopustimoy kontsentratsii tillama v vozdukhe rabochey zony. [Experimental data for the determination of the maximum allowable concentration of Tillam in workplace atmosphere.]** *Gig. Sanit. 37(8): 104-105; 1972.* (8 references) (Russian)

Toxicological properties of Tillam (pebulate) were studied on white rats, mice, cats, and rabbits. The LD50 values determined for white mice and white rats, and the minimum locally effective dose for cats were 750, 1,125, and 750 mg/kg, respectively. The amount of local irritation was moderate. Slight toxic effects on skin (with an LD50 value of 2 g/kg in rat) and slight cumulative effects were determined. Single inhalation tests of 4 hr duration revealed a threshold concentration of 9 mg/m^3. Rats and cats exposed to a Tillam concentration of 4.7 mg/m^3 for four months showed no clinical poisoning symptoms; however, reduced phagocyte activity, blood pyruvic and lactic acid levels, and increased blood residual nitrogen level, alpha-ketoglutarate oxidase and pyruvate dehydrogenase activities were observed. Slight, reversible hemodynamic and dystrophic changes in the inner organs were found. Doses of up to 1/20 of LD50 failed to produce gonadotoxic and embryotoxic effects. A concentration of 4.7 mg/m^3 as a threshold concentration in the chronic exposure of cats and rats and a maximum allowable concentration of 1 mg/m^3 is recommended.

73-0377. Nayshteyn, S. Y.; Leibovich, D. L. (Marzeyev Res. Inst. of Gen. and Environ. Hyg., Kiev, USSR). **Effect of small doses of DDT and lindane and their mixture on sexual function and embryogenesis in rats.** *Hyg. Sanit. 36(5): 190-195; 1971.* (8 references)

English translation; for an abstract of the original Russian article, *Gig. Sanit.* 36(5): 19-22; 1971, see Abstract no. 72-0827.

73-0378. Srivastava, D. N.; Parasar, G. C. (College of Vet. Sci. and Anim. Husbandry, Mhow, Madhya Pradesh, India). **Studies on toxic effects of malathion in fowls.** *Indian J. Anim. Sci. 41(12): 1154-1158; 1971.* (11 references)

ChE activity and several other parameters were compared in white leghorn cockerels after topical administration of a therapeutic and an acute toxic dose of malathion, and after prophylactic or therapeutic treatment of acute toxicity with atropine and/or 2-PAM. The external therapeutic doses were established at 2.5 g of 4% malathion dust/kg and 50 cc of 1.5% malathion emulsion/kg in water. No inhibition was observed with the non-toxic dose. Some reactivation of ChE activity was observed with 2-PAM (5 mg/kg) and still more with a mixture of atropine sulfate 2 mg/kg and 2-PAM. In spite of treatment highly significant inhibition was observed. The group receiving no prophylactic or therapeutic treatment exhibited the maximum latent period and time of death. Atropine prolonged the time of death.

73-0379. Bhatia, S. C.; Sharma, S. C.; Damodaran, V. N.; Venkitasubramanian, T. A. (Vallabhbhai Patel Chest Inst., Univ. of Delhi, Delhi, India). **Changes in rat ascorbic acid status and adrenocortical activity during acute dieldrin toxicity.** *Indian J. Biochem. Biophys. 8(1): 57-58; 1971.* (13 references)

A short communication reports an increase in plasma, liver, spleen, kidney, heart, and brain ascorbic acid levels and a decrease in cholesterol and ascorbic acid contents of adrenals 24 hr after administration of a single dose of dieldrin at 30 mg/kg to rats. Ascorbic acid in the spleen of control animals was 391 ± 18 μg/g and of treated animals was 589 ± 32 μg/g. Cholesterol in the adrenal was reduced from 11.86 ± 0.45 to 6.91 ± 0.36 mg/g; ascorbic acid content was lowered about 30%; and the weight of the adrenals remained the same. The results are indicative of increased adrenocortical activity.

73-0380. Yanev, S. (Author address not given). **The effect of serotonin on the survival time of albino mice poisoned with organophosphorous anticholinesterase drugs.** *Izv. Inst. Fiziol. Bulg. Akad. Nauk. 13: 101-110; 1970.* (31 references)

The effects of serotonin, and serotonin precursor, antagonist, depletor, and degradation inhibitor on the survival time of male mice given lethal doses of organophosphates were investigated. Survival time was prolonged upon simultaneous treatment of animals with serotonin creatine sulfate (30 and 60 mg/kg) and DFP, paraoxon, or trichlorfon, but the number of survivors was not affected. Treatment with serotonin 30 min before poisoning yielded the same results with DFP and trichlorfon, but not paraoxon. With serotonin the organophosphates caused no tremor, a delayed respiratory disturbance, and tremors of the limbs only before death. Pretreatment with Deseril, a serotonin antagonist, prevented the effect of serotonin simultaneously injected with organophosphates. Alone it reduced survival time of mice poisoned with paraoxon, but not those poisoned with trichlorfon and DFP. Significant

prolongation of survival time was observed after treatment with paraoxon at 4 hr, DFP at 4 and 20 hr, and trichlorfon at 1,2,4, and 20 hr prior to organophosphate administration. The monamine oxidase inhibitor Nialamid, administered 17 hr in advance, significantly reduced the survival time with DFP alone and canceled the effect of serotonin administered with DFP.

73-0381. Hass, D. K.; Collins, J. A.; Kodama, J. K. (Health and Nutr. Dept., Biol. Sci. Res. Cent., Shell Development Company, P.O. Box 4248, Modesto, CA 95352). **Effects of orally administered dichlorvos in rhesus monkeys.** *J. Amer. Vet. Med. Ass. 161(6): 714-719; 1972.* (19 references)

Dichlorvos was administered at various dosages as a pelleted polyvinyl chloride resin formulation (20% active ingredient) daily or twice daily to 32 rhesus monkeys for 10 to 21 days. Twenty-four of the animals were parasitized with *Schistosoma mansoni*. None of the monkeys treated with daily doses up to 80 mg/kg developed the syndrome typical of organophosphate poisoning. Complete inhibition of AChE occurred after about seven doses. The erythrocyte enzyme reached normal levels about 60 days after termination of treatment. Partial anorexia, diarrhea, salivation, and emesis were observed, but the animals remained vigorous, agile, and apparently healthy. Of the infected monkeys, 21% of the dichlorvos-treated and 22% of the nonmedicated animals died.

73-0382. Bratkowski, T. A.; Matsumura, F. (Dept. of Entomol., Univ. of Wisconsin, Madison, WI 53706). **Properties of a brain adenosine triphosphatase sensitive to DDT.** *J. Econ. Entomol. 65(5): 1238-1245; 1972.* (9 references)

Adenosine triphosphatase (ATP phosphohydrolase, E. C. 3.6.1.3) activity which is sensitive to DDT as compared with a noninsecticidal analog DDE has been found in the synapses of rat brain. Inhibition of the Mg^+-, Na^+-, and K^+-stimuated enzyme component by DDT required a particular combination of the cations which did not favor optimal Na^+-K^+ ATPase activity. The system exhibited a negative temperature correlation in DDT sensitivity. The I50 of the Na^+ and K^+ activated component against DDT was 10^{-6} *M*, and the system was relatively insensitive to other chlorinated hydrocarbon insecticides. A portion of the enzyme activity could be "solubilized" by ultrasonication and eluted as one peak on Sephadex columns together with bound ^{14}C-DDT. (Author abstract by permission)

73-0383. Davy, F. B.; Kleerekoper, H.; Gensler, P. (Texas A&M Univ., College Station, TX 77843). **Effects of exposure to sublethal DDT on the locomotor behavior of the goldfish (*Carassius auratus*).** *J. Fish. Res. Bd. Can. 29(9): 1333-1336; 1972.* (24 references)

A highly significant time-dependent correlation between consecutive turns in the locomotor pattern of normal goldfish (*Carassius auratus*), attributed to a "memory" process in the pertaining locomotor control mechanism in the central nervous system, is significantly reduced within four days by chronic exposure of the fish to 10 μg/liter *p,p'*-DDT. Keeping the fish in clean water during 130-139 days did not result in the restoration of the above correlation. (Author abstract by permission)

73-0384. Reinert, R. E. (Sch. of Natural Resources, Univ. of Michigan, Ann Arbor, MI 48104). **Accumulation of dieldrin in an alga (*Scenedesmus obliquus*), *Daphnia magna*, and the guppy (*Poecilia reticulata*).** *J. Fish. Res. Bd. Can. 29(100): 1413-1418; 1972.* (11 references)

Scenedesmus obliquus, *Daphnia magna*, and *Poecilia reticulata* accumulated dieldrin directly from water; average concentration factors (concentration in organism, dry weight, divided by concentration in water) were 1282 for the alga, 13,954 for *D. magna*, and 49,307 (estimated) for the guppy. The amount accumulated by each species at equilibrium (after about 1.5, 3-4, and 18 days, respectively) was directly proportional to the concentration of dieldrin in the water. *Daphnia magna* and guppies accumulated more dieldrin from water than from food that had been exposed to similar concentrations in water. When guppies were fed equal daily rations of *D. magna* containing different concentrations of insecticide, the amounts of dieldrin accumulated by the fish were directly proportional to the concentration in *D. magna*; when two lots of guppies were fed different quantities of *D. magna* (10 and 20 organisms per day) containing identical concentrations of dieldrin, however, the amounts accumulated did not differ substantially. (Author abstract by permission)

73-0385. Nadler, J. V.; Horwitch, P.; Cooper, J. R. (Dept. of Pharmacol., Yale Univ. School of Med., New Haven, CT 16510). **Effects of sodium fluoroacetate on the metabolism of *N*-acetylaspartate and aspartate in mouse brain.** *J. Neurochem. 19(9): 2107-2118; 1972.* (23 references)

Pretreatment with sodium fluoroacetate increased the percentage of radioactivity recovered as unmetabolized precursor in the TCA extracts of mouse brain. This occurred at both convulsant (33 mg/kg) and subconvulsant (3.3 mg/kg) doses when [aspartyl-U-^{14}C]*N*-acetylaspartic acid (NAA) was the precursor. Pretreatment also lowered the specific activity of aspartate relative to that of NAA. A subconvulsant dose inhibited the labeling of glutamine from this precursor, but not the labeling of glutamate or aspartate. When L-[U-^{14}C] aspartic acid was used as precursor, the specific radioactivity of glutamine relative to that of glutamate was much lower. Tracer amounts of the labeled aspartic acid reduced the content of NAA in brain and raised the glutamine content. No additional effect on the relative

specific radioactivity of glutamine, or the content of NAA, aspartate, glutamate, or glutamine was observed with sodium fluoroacetate treatment when the L[U-^{14}C] aspartic acid was the precursor. The results suggest a selective inhibition both by sodium fluoroacetate and exogenous aspartic acid of the tricarboxylic acid cycle in brain associated with glutamine biosynthesis.

73-0386. Wang, C. M.; Narahashi, T.; Scuka, M. (Dept. of Physiol. and Pharmacol., Duke Univ. Med. Cent., Durham, NC). **Mechanism of negative temperature coefficient of nerve blocking action of allethrin.** *J. Pharmacol. Exp. Ther. 182(3): 442-453; 1972.* (16 references)

Results of an investigation of the effects of temperature on the activity of allethrin indicate that the negative temperature coefficient of the nerve blocking action can be explained in terms of three membrane conductance parameters that control the nerve excitability. Decreasing the temperature from 23° to 9°C greatly accelerated and potentiated the blockage of action potential of squid giant axons with little or no change in the resting potential. Allethrin suppressed the increase in steady-state potassium conductance and prolonged the falling phase of transient sodium conductance. The compound also depressed the increase in transient sodium conductance, shifted the curve relating the transient conductance to the membrane potential in the direction of depolarization, and shifted the steady-state sodium inactivation curve in the direction of hyperpolarization. Lowering the temperature from 23° to 8°C augmented these effects, and changes induced by lowering the temperature were reversible.

73-0387. Desaiah, D.; Cutkomp, L. K.; Koch, R. B.; Yap, H. H. (Dept. of Entomol., Fish., and Wildl., Univ. of Minnesota, St. Paul, MN). **Tetradifon (Tedion): A specific inhibitor of Mg^{2+} dependent mitochondrial adenosine triphosphatase activity.** *Life Sci. (Pt. II) 11(7): 389-395; 1972.* (24 references)

An acaricide, tetradifon (Tedion), is a potent inhibitor of mitochondrial Mg^{2+} ATPase, 50% inhibition occuring at $5X10^{-5}M$ for a fish brain homogenate preparation. Although the widely used 'standard' material, oligomycin, is somewhat more effective on mitochondrial Mg^{2+} ATPase, it is less specific than tetradifon to related ATPase enzymes. Tetradifon inhibited less than 20% of Na^+-K^+ ATPase over a wide range of concentrations, while oligomycin inhibited about 50% Na^+-K^+ ATPase at the concentration which gives nearly complete inhibition of mitochondrial Mg^{2+} ATPase in the fish brain preparations. (Author abstract by permission)

73-0388. Davydova, I. R. (All-Union Res. Inst. of Dairy Production, Moscow, USSR). **Vliyaniye pestitsidov na fermenty moloka. [The action of pesticides on milk enzymes.]** *Moloch. Prom. 33(4): 20-21; 1972.* (10 references) (Russian)

The effects of phosphamide (dimethoate), DDVP, trichlorometaphos-3 (*O*-methyl *O*-ethyl *O*-2,4,5-trichlorophenyl thiophosphate), and lindane on alkaline phosphatase, and of phosphamide and DDVP on peroxidase were studied. The pesticides were introduced into milk samples in the form of their alcoholic solutions in doses ranging from 3 mg to 30 g/l. A phosphamide concentration of 3 mg/l. caused a reduction of 10% in the activity of peroxidase, and a concentration of 3 g/l. induced total inhibition. The other pesticides present in concentrations of 3-30 mg/l. had no inhibitory effect on the enzymes while the rate of inhibition due to 3-30 g/l. concentrations was 30%.

73-0389. Falk, H. L. (Nat. Inst. Environ. Health Sci., Dept. of Health, Educ. and Welfare, Pub. Health Services, NIH, Research Triangle Park, NC). **Pesticides as carcinogens.** *Nat. Pest. Contr. Oper. News 31: 4-6, 29-31; 1971.* (1 reference)

In order to determine the carcinogenicity and teratogenicity of economically important or potentially hazardous environmental chemicals, 130 compounds, mainly pesticides, were tested in mice at the highest doses tolerated. In order to avoid losing animals to causes other than tumors, a study period of 18 months was chosen. Evaluation of results at that point was difficult for the Food and Drug Administration because most of the tumors observed were benign but would probably have become malignant with time. Other difficulties were encountered in extrapolating the data to man, including differences in state of health and tolerance for the compound. The single level used in the study was on the order of 1000 times the present human intake of many of the pesticides, but differences between the species make this a small safety factor. Of the compounds tested, the organochlorines produced the highest incidence of hepatomas. Piperonyl butoxide had some carcinogenic properties and prevented rapid detoxification of other chemicals by blocking enzyme systems. Acid labile synergists are safer in terms of mammals. Very few of the herbicides tested produced tumors, but they were teratogenic, 2,4,5-T having an effect at 100 mg/kg. Amitrole produced tumors in the thyroid and liver. Captan, although probably mutagenic and teratogenic, was not carcinogenic. Pentachloronitrobenzene and related compounds also produced tumors.

73-0390. Ueda, K.; Nishimura, M.; Maebashi, H.; Miyazaki, T.; Ogata, S.; Kawamura, A. (School of Hyg., Tokyo Dental College, Chiyoda, Tokyo, Japan). **[Experimental chronic intoxication induced by organophosphorus pesticides in beagles.]** *Nippon Noson Igakkai Zasshi (J. Jap. Ass. Rural Med.) 21(2): 98-99; 1972.* (Japanese)

Small amounts (2 mg/kg) of fenthion and fenitrothion were administered p.o. daily to two groups of two beagles (6-7 kg) for 379 days. During the experimental period, serum and erythrocyte ChE measurements, hematological examinations, blood chemistry examinations, general examinations, urinalysis, and ophthalmological examinations were carried out once a month. Serum ChE activity began to decrease two weeks after administration with large fluctuations; erythrocyte ChE stabilized at a lowered value after two months administration; plasma ChE activity showed a similar change with fluctuations. Slight salivation and diarrhea were observed without other anomalies in general health condition. No anomalies were found in the blood examinations. After the dogs were sacrificed, ChE activities of liver and brain were determined; ChE liver values were 0.53 and 0.36 in the fenitrothion group, 0.41 and 0.36 in the fenthion group, compared to 0.79 and 1.10 ΔpH/hr in controls; those of brain were 0.36 and 0.33 (fenitrothion), 0.26 and 0.27 (fenthion), compared to 0.45 and 0.54 in controls. Only one anomaly was observed during ophthalmological examinations: the radius of curvature of the cornea decreased.

73-0391. Whitehead, C. C.; Downie, J. N.; Phillips, J. A. (Agr. Res. Council Poultry Res. Cent., Edinburgh EH9 3JS, Scotland). **BHC not found to reduce the shell quality of hen's eggs.** *Nature (London) 239(5372): 411-412; 1972.* (10 references)

Daily doses of lindane equivalent to 10, 100, and 200 mg/kg of diet reduced the rate of egg production in laying hens 9.1%, 30.1%, and 29.3%, respectively, after one month of treatment. Shell thickness values did not vary significantly with treatment, and shell calcium expressed as a percentage of egg wt decreased to a similar extent in control and treated groups. Position in clutch did not affect shell thickness or calcium content in any of the groups. Shearing strength per unit thickness of shell was also unaffected. No shell abnormalities in treated groups were revealed by scanning electron microscopy. Although lindane reduced egg production, it did not have an effect on the eggshells of hens fed a diet containing adequate calcium.

73-0392. Portig, J.; Koransky, W.; Wahner-Roedler, D. (Inst. fur Toxikol. und Pharmakol., Philipps Univ., Marburg, Germany). **The biotransformation of nikethamide in the rat and its acceleration by hexachlorocyclohexane.** *Naunyn Schmiedebergs Arch. Pharmakol. Exp. Pathol. 274(2): 154-170; 1972.* (21 references)

Nicotinic acid monoethylamide, nicotinamide, and nikethamide-*N*-oxide have been identified by cocrystallization with authentic carriers as major products of the biotransformation of tritiated nikethamide in the rat. Nicotinic acid appears to be a minor metabolite of the analeptic in this species. Both *N*-desalkylation and *N*-oxidation of nikethamide are enhanced in rats given 200 mg/kg of alpha-hexachlorocyclohexane (BHC) once i.p. The beta- and gamma- isomers of hexachlorocyclohexane, when tested for their effect on the capacity of rat liver to desethylate the analeptic in vitro, have been found to be as effective as the alpha-isomer. A convulsive dose of nikethamide given i.p. is shown to become ineffective in rats pretreated with alpha-hexachlorocylohexane primarily as a consequence of accelerated biotransformation of the analeptic. Rats can be made tolerant of nikethamide by daily injection of a convulsive dose of the drug for four to five days. Such animals metabolize ^{3}H-nikethamide faster than nontolerant controls. (Author abstract by permission)

73-0393. Maehashi, H. (Dept. of Pharmacol., Tokyo Dental Coll., Tokyo, Japan). **On the pathogenicity to mammals of the new bacterial insecticide-*Bacillus moritae*.** *Nippon Eiseigaku Zasshi (Jap. J. Hyg.) 27(2): 267-274; 1972.* (9 references)

In acute and subacute toxicity tests, feeding spores of the bacterial insecticide *Bacillus moritae* to mice and rabbits had no detrimental effects on the animals. In one test rabbits showed no adverse effects from the feeding of *Bacillus moritae* spores for 100 days at a level 100 times as high as the concentration recommended for field application. Vegetative cells of *Bacillus moritae* were not detected in blood cultures after oral administration. Following intraperitoneal injection of the spores, an LD50 value of 350 mg/kg was found. Bacteria were detected in the blood for 2-10 days after administration and in the peritoneal cavity for more than 30 days. Death in mice following intraperitoneal spore injection was presumed due to bacillemia. After intravenous injection of 5 mg of spores in rabbits, bacteria were detected in the blood of all test animals until the 6th day, decreasing more slowly than after intraperitoneal injection. No increase in virulence was found after serial passage of the bacteria through mice for three transfers.

73-0394. Maehashi, H.; Fujiyoshi, N. (Dept. of Pharmacol., Tokyo Dental College, Misaki, Chiyoda, Tokyo, Japan). **Transient bacillemia by bio-insecticides in chronic feeding test on mice (*Bacillus moritai* Series No. 2).** *Nippon Eiseigaku Zasshi (Jap. J. Hyg.) 27(3): 342-346; 1972.* (8 references)

Blood of mice fed spores of *B. moritai* at 1.0×10^{9}, 5.0×10^{9} and 5.0×10^{8} spores/g diet contained few bacteria, and there was no dose response. A considerable amount was detected in lung, kidney, spleen, liver, and heart and the amount was dose-related. Although the diet was fed for 7 mo, a lower accumulation was observed at 7 than at 3 mo, and levels declined rapidly following withdrawal from treatment. No effect was observed on rectal temperature, food consumption, or growth rates of the mice. A similar pattern of

accumulation was obtained with *B. thuringiensis*. Results from this and other studies suggest that bacterial contamination occurs when spores are ingested. Even if spores are non-pathogenic to humans, possible allergic reaction to the spores should be checked before extended use in the field.

73-0395. Asanuma, S.; Otsuji, H.; Nakamura, S.; Hirooka, Y.; Kurosawa, K. (Jap. Inst. of Rural Med. Usuda, Nagano Prefect., Japan). **[Experimental studies on residues of organophosphorus pesticides in animals.]** *Nippon Noson Igakkai Zasshi (J. Jap. Ass. Rural Med.) 21(2): 306-307; 1972.* (Japanese)

The residues and effects of fenitrothion, an organophosphorus insecticide, were examined in Wistar rats and two species of monkeys. Six groups of male rats were orally administered a suspension of fenitrothion (300 mg/kg) in olive oil. Three rats were sacrificed after 1.3, 9, 24, 48, and 120 hr and the amount of fenitrothion determined in blood, brain, liver, and kidney. Extraction was done with petroleum ether and acetonitrile and GC used. The ChE activities in serum, erythrocyte, brain, liver, and kidney were also determined. The residual amount of fenitrothion peaked 9-24 hr after administration and could scarcely be detected after 120 hr. The ChE activities in several organs and blood did not show the same tendency, suggesting a slow recovery from inhibition. In another experiment fenitrothion was administered orally to two monkeys and the fenitrothion residues traced for nine days. In the serum of one monkey fenitrothion residues peaked at 0.300 ppm 5 hr after administration and in another monkey at 0.425 ppm after 2 hr. Organophosphorus compounds have been thought to decompose rapidly; however, fenitrothion remained for some hours in organs, especially in liver and kidney.

73-0396. Takano, Y.; Nakamura, T.; Terui, Y.; Atsumi, K.; Mita, K. (Yamamoto Co-operative Federation General Hospital, Akita Prefect., Japan). **[Experimental results of long-term oral administration of small amounts of various pesticides to rabbits.]** *Nippon Noson Igakkai Zasshi (J. Jap. Ass. Rural Med.) 21(2): 308-309; 1972.* (Japanese)

The relationship between the use of pesticides and abnormal medical findings such as neural symptoms in farmers were explored. Oral daily doses of 1.5 mg/kg of technical BHC (1/400 LD50), 0.05 mg/kg of ethyl mercury phosphate (Lignasan) (1/800 LD50), and 0.5 mg/kg of fenitrothion (1/800 LD50), were given to rabbits for six months. Examinations were made on fatty acids extracted from the treated animals and analyzed. A decrease of linoleic acid was noticed in the blood, the phenomenon supposedly related to such clinical symptoms as vomiting, diarrhea, and alopecia. Decreases of C16 acid and C22-24 acids and an increase of C18:1 acid were noticed in white matter; an increase of C18 acids and decreases of higher fatty acid were noticed in gray matter regardless of the pesticide administered. C18 acids increased and higher fatty acids decreased in the cerebellum after administration of Lignasan and fenitrothion. Findings were obtained in the optic nerve, iris, and crystalline lens; the latter two related to visual field stenosis or abnormal regulation were affected by Lignasan. Histological examination of livers of treated animals revealed atrophied hepatic cells with random cytofibrils and enlarged sinusoids from each pesticide. The changes were conspicuous in the animals given Lignasan in cells with condensed nuclei and plasts. Necrosis, fatty degeneration, or inflammatory infiltration of hepatic cells were not observed. The effect of pesticides on the human body appears to be additive and potentiative in these cases.

73-0397. Matsushima, S.; Abe, E.; Kurosawa, K.; Yanagisawa, T.; Sasaki, K.; Yamazaki, H.; Shimazaki, K. (Japan Inst. of Rural Med., Usuda, Nagano Prefect., Japan). **[Experimental study on subacute toxicity of fenitrothion.]** *Nippon Noson Igakkai Zasshi (J. Jap. Ass. Rural Med.) 21(2): 310-311; 1972.* (Japanese)

In subacute toxicity experiments fenitrothion (98.6% purity) was orally administered to three groups each of rabbits and monkeys, *Macaca irus*. The insecticide was dissolved in olive oil and given intragastrically to rabbits at a daily dose of 1, 3, or 10 mg/kg (six per group) for a period of three months. The insecticide in olive oil was injected into a banana and given to the monkeys at a daily rate of 0.1, 0.5, or 2.0 mg/kg (three per group) for six months. No clinical symptoms were noticed including motor disturbance and no anomalies were found in general blood examination. Examinations of urine carried out only on monkeys revealed nothing. ChE activity was reduced in two rabbits of the 10 mg/kg group in serum, erythrocyte, brain, and liver, and in three monkeys of the 2.0 mg/kg group, both in serum and erythrocyte levels and two in brain and liver. No anomalies were found in cornea, pupil, fundus, and refraction. Micro-histopathological examinations of internal organs revealed some slight changes in kidney (turbid swelling of epithelium of tubules) in rabbits and slight changes in liver (infiltration and edema of cells of Glisson's capsule) in monkeys. Motor end plates changed conspicuously, especially on the outer ocular muscles in all monkeys and rabbits given more than 3.0 mg/kg. The synapse was affected in the monkeys given 2.0 mg/kg. Lymphatic cerebral meningitis found in two monkeys and in two rabbits and edema found in cerebral vein walls of all rabbits were not attributed directly to the insecticide. The species specificity of fenitrothion, however, is more conspicuous in higher vertebrates (primates) than in rodents.

73-0398. Horiguchi, Y.; Yanagisawa, T. (Jap. Inst. of Rural Med., Usuda, Nagano Prefect., Japan). **[Experi-**

mental study on the effect of organophosphorus pesticides on the central nervous system.] *Nippon Noson Igakkai Zasshi (J. Jap. Ass. Rural Med.) 21(2): 312-313; 1972.* (Japanese)

In a study of the effects of organophosphate poisoning on the central nervous system, rabbits and monkeys were immobilized with gallamine, then the EEG recorded from various brain areas. Malathion or fenitrothion was administered intravenously or perorally at the time when the animals were awakening. Waves showing characteristics of arousal continued in animals given low doses of the pesticides; no seizures or changes in heart rate or blood pressure were noted. In animals given large amounts of the pesticides, a gradual decrease in heart rate and blood pressure occurred before any change in the EEG; then, accompanying the appearance of a rhythmic slow wave from the hippocampus, the blood pressure increased without change in the heart rate. Following a renewed drop in blood pressure and extreme slowing of the heart rate, a fast hippocampal wave appeared, followed by the appearance of spikes in the hippocampal tracing. The seizures gradually spread to all parts of the brain, forming a spike and wave complex. The generalized seizure threshold for malathion in the rabbit was 550 mg/kg by intravenous administration and 450 mg/kp per os; for fenitrothion, 450 mg/kg intravenously and 250 mg/kg per os. Generalized seizures began about 1 hr after pesticide administration.

73-0399. Kawai, M.; Ueda, K. (Sch. of Hyg., Tokyo Dent. Coll., Tokyo, Japan). **[Effect of glutathione on acute intoxication due to methyl bromide.]** *Nippon Noson Igakkai Zasshi (J. Jap. Ass. Rural Med.) 21(2): 314-315; 1972.* (Japanese)

The effects of reduced glutathione (GSH) administration in acute methyl bromide poisoning were investigated by determining GSH and β-glucuronidase levels in the blood serum of experimentally protected and poisoned mice and rabbits. GSH or BAL (dimercaprol) was administered prior to a single inhalation exposure to methyl bromide at 1850 ppm for 1 hr (LC100), or prior to 2-hr daily inhalation of 700 or 200 ppm methyl bromide for 10 and 21 days respectively. In the acute experiments 100% of the mice given GSH at 750 mg/kg i.p. survived, compared to 40% of mice given GSH at 250 mg/kg and 40% of mice given BAL at 50 mg/kg. Serum GSH was raised from 42 to 44-56 mg/kg by administration of GSH at 250-750 mg/kg, and to 49 mg/kg by administration of BAL at 100 mg/kg; in the same animals, serum β-glucuronidase was raised from 2.0 to 2.7-3.2 by GSH and 4.9 by BAL. Following methyl bromide inhalation in acute experiments, the serum GSH levels in GSH-pretreated animals were 16-22 mg/kg, and 14 mg/kg in BAL-pretreated animals, compared to 13 mg/kg for animals exposed without pretreatment. Symptoms of methyl bromide intoxication in animals given GSH at 20 mg/kg, then exposed to an atmosphere containing methyl bromide at 700 ppm for 2 hr per day, did not differ from those of unprotected animals. The quantity of GSH administered may have been inadequate.

73-0400. Sugimoto, T. (Biological Res. Lab., Nihon Nohyaku Co. Ltd., Kawachi-Nagano, Osaka Prefect., Japan). **[Studies on ocular disturbance by improved blasticidin-s dust formulation.]** *Nippon Noson Igakkai Zasshi (J. Jap. Ass. Rural Med.) 21(2): 316-317; 1972.* (Japanese)

The dust formulation containing 0.08% of the active ingredient of blasticidin-S (a fungicide against rice blast) caused ocular disturbances such as lacrimation, hyperemia, or pain when the formulation got into the eyes during applications. The addition of calcium acetate to the formulation seemed to lessen the disturbances; confirmation was obtained by experiments with rabbits. The standard formulation used in the experiment contained 0.15% of the active ingredients. Ocular injuries were not alleviated by addition of 0.5% of calcium acetate to the formulation. With the addition of 5% of calcium acetate the injuries were scarcely apparent, even when 2 mg of the formulation were applied to one eye. In field experiments the standard formulation induced moderate to heavy blepharitis and hyperemia in conjuctiva of eyelids and eyeballs with the application of 1-2 kg/ha of the dust. The improved formulation containing 5% calcium acetate induced only a slight hyperemia on conjunctiva in eyelids with the application of 2 kg/ha and only a slight injury on the epithelium of the cornea.

73-0401. Egloff, D.; Partridge, R. (Dept. of Biol., Oberlin College, Oberlin, OH 44074). **Resistance to DDT of a freshwater alga.** *Ohio J. Sci. 72(1): 6-10; 1972.* (19 references)

DDT at concentrations up to 1000 ppb had no significant effect on the rate of oxygen consumption in the dark or on the net photosynthetic evolution of oxygen in the light by the alga *Chlamydomonas reinhardtii* Dangeard in both acetate and non-acetate mediums. The rate of cell division and the final number of cells produced after 9 days were also not affected. Qualitative observations of the cultures indicated similar cell mobility and pigmentation between control and treated cells. In a natural situation this resistant species would be expected to displace less tolerant species in polluted areas and consequently reduce or alter the species composition of the ecosystem.

73-0402. Hashida, K. (Dr. Hiraki School of Intern. Med., Fac. of Med., Okayama Univ., Okayama, Japan). **[Studies on organofluorine pesticide intoxication. I. Experimental and clinical studies on the therapy of organofluorine pesticide intoxication.]** *Okayama Igakkai Zasshi (J. Okayama Med. Soc.) 83(7-8): 273-293; 1971.* (Japanese)

Monofluoroacetamide (MFA) was orally administered by a stomach tube to groups of Wistar rats at 20, 30, 50, and 100 mg/kg and to a group of rabbits at 30 mg/kg as a 10% aqueous solution. All the rats given 100mg and 50 mg/kg died within 24 hr. No rats given 20 and 30 mg/kg died; all the rabbits died after 2.5 hr. The symptoms in rats (50 mg/kg) were excitation with active movement, general convulsion, then lethargy and occasional convulsion. The symptoms in rabbits were general convulsion, cyanosis, and ventricular fibrilation on ECG. Experimental therapeutic treatments were carried out on rats given MFA at 50 mg/kg and on rabbits given MFA at 30 mg/kg. The results show that acetamide was most effective for the intoxicated rats at doses of 500 mg/kg every eight hours. Ethanol, monoacetin, and glucose prolonged life somewhat while phenobarbital and procainamide were least effective. Acetamide and procainamide (500 mg/kg i.m. every two hr plus procainamide 50 mg/kg. i.m. every three hr) were most effective on rabbits, but with less success than in rats. MFA tends to lower the blood sugar of rats proportional to dose and is related to convulsions; methyl parathion and endrin increase the blood sugar. The finding gives an important criterion for the etiology in diagnosing pesticide intoxication. In humans acute intoxication by Nissol, an organofluorine, lowers the blood sugar level triggering loss of consciousness; the administration of large amounts of glucose was highly effective.

73-0403. Hashimoto, Y.; Mori, T.; Noguchi, T. (Bio-Med. Res. Div., Nisso Inst. for Life Sci, Oiso, Kanagawa, Japan). **Some pharmacologic and biochemical properties of *O,O*-dimethyl-*S*-(2-acetyl-aminoethyl) dithiophosphate (DAEP).** *Oyo Yakuri (Pharmacometrics) 6(4): 613-620; 1972.* (11 references)

A number of pharmacologic and biochemical tests were performed in order to characterize the activity of DAEP, an organophosphate of low mammalian toxicity. Doses of up to 40 mg/kg of DAEP did not affect body temperature or analgesic, sedative, and hypnotic actions in mice or rats. Respiratory depression, fall in blood pressure, and decrease of heart rate were observed in rabbits given more than 200 mg/kg, i.v. Surface anesthetic action and irritability on mucous membrane and mydriatic action could not be detected. No in vivo antihistiminic or antiadrenergic effects were obtained with DAEP. The compound exhibited no anticoagulant or hemolytic activity in vitro or in vivo and did not affect the red or white blood cell count or the hematocrit in rabbits. Rabbit blood ChE was inhibited to a lesser degree by DAEP than by dimethoate. DAEP in vivo exhibited a slightly stronger and longer-lasting inhibition of ChE. Erythrocyte ChE was rapidly inhibited after a single oral dose of 100 mg/kg DAEP in rats.

73-0404. Hashimoto, Y.; Makita, T.; Noguchi, T. (Bio-Med. Res. Div., Nisso Inst. for Life Sci., Oiso, Kanagawa, Japan). **Teratogenic studies of *O,O*-dimethyl-*S*-(2-acetylaminoethyl) dithiophosphate (DAEP) in ICR strain mice.** *Oyo Yakuri (Pharmacometrics) 6(4): 621-626; 1972.* (6 references)

The possible lethal, growth suppressing, and teratogenic effects of *O,O*-dimethyl-*S*-(2-acetylaminoethyl) dithiophosphate were studied in mice given 8, 20, and 40 mg/kg orally through the first 14 days of gestation. In the group treated at 40 mg/kg, growth was retarded and the average litter size, number, and the mean body weight of surviving fetuses was larger in this group. The only gross malformation observed was cleft palate, which occurred normally in the strain of mice used. Cleared skeletons stained with alizarin red S showed no significant elevation in the incidence of malformations in treated groups.

73-0405. Noda, K.; Numata, H.; Hirabayashi, M.; Endo, I. (Sch. of Legal Med., Fac. of Med., Shinshi Univ., Matsumoto, Japan). **[Influence of pesticides on embryos. I. On influence of an organophosphorus pesticide.]** *Oyo Yakuri (Pharmacometrics) 6(4): 667-672; 1972.* (10 references) (Japanese)

In order to investigate the effects of a representative organophosphate compound on embryonic development, parathion emulsion was applied at the rate of 1.4 mg/kg (active ingredient) to the shaved skin of the backs of Wistar rats. Dams were killed and examined on the 20th day after conception. In the group treated on days 1-7 (group 1), 64% of the dams conceived, compared to 77% of the dams in the group treated on days 7-13 (group 2), and 85% of controls. The average number of implantations in group 1 was 4.7; in group 2, 11.4; and in controls, 10.0. The number of live fetuses at autopsy was 3.9, 9.1, and 8.7; average weight of live fetuses was 3.86, 3.46, and 3.67 g respectively. Embryonic mortality rates averaged 16.2, 20.2, and 12.7 respectively. Mortality in group 2 was composed of 34.8% missed implantations, 47.8% resorptions, and 17.4% fetal deaths. No developmental anomalies were apparent in treated animals except for defective ossification of the sternebrae and shortness of the fourteenth rib in some fetuses from group 2. Serum cholinesterase values were decreased in parathion-treated rats. Thus the fetal death observed after parathion administration was presumably due to toxic effects in the dams.

73-0406. Noda, K.; Hirabayashi, M.; Yonemura, I.; Maruyama, M.; Endo, I. (Dept. of Leg. Med., Shinshu Univ. Med. Sch., Matsumoto, Japan). **[Influence of pesticides on embryos II. On the influence of organochlorine pesticides.]** *Oyo Yakuri (Pharmacometrics) 6(4): 673-679; 1972.* (10 references) (Japanese)

An endrin emulsion was administered orally once a week for four weeks to virgin female rats and mice at 0.58 mg/kg. The animals were mated one week after the last administration and killed on day 18 (mice) or 20

(rats) of pregnancy. Fetal mortality rates were 13% for treated mice and 9% for controls, 34% for treated rats and 17% for controls. The number of implantations averaged 11 in treated mice and 13 in controls, 12 in treated rats and 14 in controls. There were 15 malformed or immature fetuses in the treated mice and 8 in controls. The most frequently occurring malformation was club-foot. In rats which were mated at longer time intervals after endrin administration, the incidence of fetal death decreased approximately in proportion to delay period. The incidence of skeletal anomalies (primarily delayed and deviant ossification) was significantly elevated in treated rats. Thus it seems that organochlorine insecticides, retained in the body after administration, can interfere with development of subsequently conceived fetuses.

73-0407. Hashimoto, Y.; Makita, T.; Nishibe, T.; Mori, T.; Ohnuma, N.; Noguchi, T.; Fukuda, Y. (Bio-Med. Res. Div. of Nisso Inst. for Life Sci., Nippon Soda Co., Ltd., Oiso, Kanagawa, Japan). **Toxicological evaluation of thiophanate (III). Subacute oral toxicity study of thiophanate in beagles for six months.** *Oyo Yakuri (Pharmacometrics) 6(5): 873-887; 1972.* (15 references)

Daily oral administration of thiophanate to dogs for 180 days at 5, 50, and 500 mg/kg had no significant effects on body wt, mortality, hematology, urine composition, gross pathology, organ wt, and organ wt ratios. Histopathological changes were observed in the spleen, lung, liver, kidney, and thyroid of both control and treated animals and were attributed to infectious diseases. A slight effect on the thyroid of two dogs in the high dose group could have been thiophanate related.

73-0408. Zuberi, R.; Zubairi, M. Y. (PCSIR Lab., Karachi, Pakistan). **Carbaryl degradation by *Pseudomonas phaseolicola* and *Aspergillus niger*.** *Pak. J. Sci. Ind. Res. 14(4-5): 383-384; 1971.* (9 references)

Carbaryl was degraded in the laboratory by two common soil microorganisms, *Pseudomonas phaseolicola* and *Aspergillus niger*. When *P. phaseolicola* was exposed to 100 mg of the carbamate, 1-naphthol equivalent to 2μg of carbaryl was found after 1 hr. The values were 4.5 μg at 2 hr, 10.5μg at 6 hr, 270μg at 24 hr and 310μg at 48 hr. An intermediate was observed which had an *Rf* between those of carbaryl and 1-naphthol on TLC. In studies involving *A. niger*, 1-naphthol production was evident. However, because of interfering materials, the components could not be separated.

73-0409. Moriyama, H.; Sugiyama, H.; Shigematsu, H. (Sericultural Experiment Station, Suginami, Tokyo, Japan). **A hydroxy metabolite derived from carbaryl in the silkworm, *Bombyx mori*.** *Pestic. Biochem. Physiol. 2(1): 1-7; 1972.* (10 references)

The hydroxy metabolite 2-hydroxy-1-naphthyl *N*-methylcarbamate, determined by IR and UV, was the primary intermediate of carbaryl metabolism in silkworm. Following topical application of 0.32 μg of ^{14}C-carbaryl to 2-day-old 5th-instar larvae (LD50 was 50 μ/g), peak tissue concentrations of the metabolite appeared at 6 hr. Application of the minimum toxic dose of 7.6 μg to 7-day-old 5-instar larvae resulted in a 1 to 2 hr peak concentration. The time of disappearance of carbaryl from tissues coincided roughly with the revival from toxic symptoms. Peak output of $^{14}CO_2$ coincided with the maximum hydroxy metabolite concentration. Carbaryl is much more slowly metabolized in the black-tipped leafhopper to which it is more toxic.

73-0410. Jones, D. W.; Foy, C. L. (Dept. of Plant Pathol. and Physiol., Virginia Polytechnic Inst. and State Univ., Blacksburg, VA 24061). **Metabolic fate of bioxone in cotton.** *Pestic. Biochem. Physiol. 2(1): 8-26; 1972.* (17 references)

Cotton leaf tissue rapidly metabolized bioxone (2-(3,4-dichlorophenyl)-4-methyl-1,2,4-oxidiazolidine-3,5-dione) to 1-(3,4-dichlorophenyl)-3-methylurea (DCPMU) and 1-(3,4-dichlorophenyl)urea (DCPU). After 12 hr of incubation, at least five metabolites accounted for the 65% of the radioactivity not corresponding to original material. Little bioxone-^{14}C was recovered in excised leaves treated through the petiole with heterocyclic ring or phenyl ring-labeled herbicide after one day. DCPMU was initially the predominant metabolite while after three days, DCPU accounted for 55 to 70% of the ^{14}C in the excised leaves. In intact plants treated through the roots, bioxone was rapidly metabolized to the same products, and little or none of the intact herbicide was translocated to the leaves. The majority of the radioactivity was found in the leaves and was recovered as DCPU and unidentified polar metabolites. The herbicide and DCPMU were 20 times as toxic as DCPU to oat, a susceptible species.

73-0411. Shishido, T.; Usui, K.; Fukami, J.-I. (Div. of Agr. Chem., Nat. Inst. of Agr. Sci., Kita, Tokyo, Japan). **Oxidative metabolism of diazinon by microsomes from rat liver and cockroach fat body.** *Pestic. Biochem. Physiol. 2(1): 27-38; 1972.* (40 references)

Rat liver microsomal preparations were more active in degrading diazinon than cockroach fat body microsomes although the same three major ether-soluble metabolites were observed. Desulfuration, hydroxylation of the ring-alkyl side chain, and cleavage of the aryl phosphate bond were the routes of oxidation of the insecticide in NADPH- or NADH-microsome systems. The major metabolic products were hydroxydiazinon, diazoxon, and hydroxydiazoxon, all having insecticidal activity; others were 2-isopropyl-4-methyl-6-hydroxypyrimidine, 2-(2′-hydroxy- 2′-propyl)-4-methyl-6-hydroxypyrimidine, diethyl phosphorothioic

acid, and diethyl phosphoric acid. EDTA stimulated the overall metabolism of diazinon. The general pathways of oxidative metabolism of this compound in mammals and insects are discussed.

73-0412. Shishido, T.; Fukami, J.-I. (Div. of Agr. Chem., Nat. Inst. of Agr. Sci., Nishigahara, Tokyo, Japan). **Enzymatic hydrolysis of diazoxon by rat tissue homogenates.** *Pestic. Biochem. Physiol. 2(1): 39-50; 1972.* (30 references)

^{32}P-labeled diazoxon (*O,O,*-diethyl *O*-(2-isopropyl-4-methyl-6- pyrimidinyl)phosphorothioate) was rapidly degraded by various rat tissue homogenates to water-soluble compounds. The liver had the highest activity; liver and blood of guinea pig, rabbit, and mouse also degraded diazoxon. The microsomes were the most active of the liver fractions from each animal, hydrolyzing diazoxon to diethyl phosphoric acid and 2-isopropyl-4-methyl-6-hydroxypyrimidine. The properties of the enzymes responsible for the degradation were similar to those of arylesterases and paraoxon-degrading enzymes. The corresponding hydrolases were apparently absent in insects, and are probably partially responsible for the selectivity of diazinon. Paraoxon was degraded, but at a slower rate, by the diazoxon-metabolizing enzymes from serum and liver.

73-0413. Shishido, T.; Usui, K.; Sata, M.; Fukami, J.-I. (Div. of Agr. Chem., Nat. Inst. Agr. Sci., Nishigahara, Tokyo, Japan). **Enzymatic conjugation of diazinon with glutathione in rat and American cockroach.** *Pestic. Biochem. Physiol. 2(1): 51-63; 1972.* (29 references)

The metabolism of ^{32}P-labeled diazinon by several tissues from rat and American cockroach was investigated in vitro. All rat tissues tested at pH 6.0 degraded diazinon to water-soluble metabolites. The activity of the liver was 14 to 89 times higher than that of other tissues. GSH stimulated liver activity 2.7 fold. Activity was also observed in the cockroach with a peak at pH 6.5 in the fat body. The mechanism of the reaction was identified as the conjugation of reduced glutathione and the pyrimidinyl moiety by a GSH *S*- transferase with simultaneous cleavage of the phosphate ester bond. Alkyl homologs of diazinon formed the same conjugates. Apparently, degradation by the GSH-conjugative process is not responsible for the difference in toxicity between mammals and insects.

73-0414. Ohkawa, H.; Ohkawa, R.; Yamamoto, I.; Casida, J. E. (Div. of Entomol., Univ. of Calif., Berkeley, CA 94720). **Enzymatic mechanisms and toxicological significance of hydrogen cyanide liberation from various organothiocyanates and organonitriles in mice and houseflies.** *Pestic. Biochem. Physiol. 2(1): 95-112; 1972.* (31 references)

The toxicity of various organothiocyanates and organonitriles to mice correlated well with the level of HCN in brain and liver. Brain levels were apparently more important than liver levels in poisoning by these compounds or by KCN. Of the insecticides tested, Lethane 384 (2-(2-butoxyethoxy) ethyl thiocyanate) had a 24-hr LD50 of 202 nmoles/g and Thanite (isobornyl thiocyanatoacetate) had a 24-hr LD50 of 553 nmoles/g. Pretreatment with *p*-aminopropiophenone reduced the toxicity of KCN, Lethane 384, and Thanite. In houseflies compounds producing the greatest degree of paralysis in 60 min were usually those resulting in the highest HCN levels. Fenitrothion reduced the toxicity of some of the test compounds, but not KCN, and probably acted by temporarily lowering the glutathione content of the liver. Supernatants of homogenates of mouse liver and whole houseflies liberated HCN in varying amounts from octyl thiocyanate, Lethane 384, and Thanite. Lethane 384 and octyl thiocyanate were apparently degraded by a glutathione-*S*-transferase in this system while Thanite reacted rapidly with glutathione alone. The enzyme catalyzes the attack of glutathione at the thiocyanate sulfur resulting in the liberation of HCN, oxidized glutathione, and the mercaptan moiety of the organothiocyanate.

73-0415. Motoyama, N.; Dauterman, W. C. (Dept. of Entomol., North Carolina State Univ., Raleigh, NC 27607). **In vitro metabolism of azinphosmethyl in susceptible and resistant houseflies.** *Pestic. Biochem. Physiol. 2(1): 113-122; 1972.* (24 references)

In vitro metabolism studies of (^{14}C-methoxy)- or (^{32}P)- azinphosmethyl in subcellular fractions of abdomens from a resistant and a susceptible strain of houseflies indicated that the enzymes involved were probably mixed-function oxidases and glutathione transferases. Higher activity of both types of enzymes was found in the resistant strain than in the susceptible strain, and resistance is probably dependent on both systems. In vivo synthesis of cofactors should be investigated to clarify the roles of each system in vivo. Oxidative desulfuration as well as dearylation occurred. Desmethyl azinphosmethyl and methyl glutathione formation was by a glutathione transferase located in the soluble fraction, and the azinphosmethyl oxygen analog was also demethylated by this enzyme. A common fraction from Sephadex G 100 chromatography of the soluble material was responsible for both transferase reactions.

73-0416. Hetnarski, B.; O'Brien, R. D. (Sec. of Neurobiol. and Behavior, Cornell Univ., Ithaca, NY 14850). **The role of charge-transfer complex formation in the inhibition of acetylcholinesterase by aromatic carbamates.** *Pestic. Biochem. Physiol. 2(1): 132-138; 1972.* (21 references)

Association constants of charge-transfer complexes formed by tetracyanoethylene and 12 of 14 aromatic carbamates tested were measured. The correlation of these constants with anticholinesterase activity reported for methylcarbamates was good (r = 0.95 to 0.99). A correlation coefficient (r) between the -log I50 and the K (association constant) for dimethyl carbamate was 0.87. Results of the study indicated that the inhibitory activity of the aromatic carbamate is related to its ability to donate electrons to a complex with the enzyme, and the aromatic ring is the electron donor. Data is reported on: phenyl methylcarbamate; *p*-fluorophenyl methylcarbamate; *p*-tolyl methylcarbamate; *p*-methoxyphenyl methylcarbamate; 1-naphthyl methylcarbamate; *p*-ethylphenyl methylcarbamate; ethyl methylcarbamate; phenyl dimethylcarbamate; *p*-chlorophenyl dimethylcarbamate; *p*-tolyl dimethylcarbamate; *p*-methooxyphenyl dimethylcarbamate; and 1-naphthyl dimethylcarbamate.

73-0417. Fukuto, T. R.; Shrivastava, S. P.; Black, A. L. (Dept. of Entomol., Div. of Toxicol. and Physiol., Univ. of California, Riverside, CA 92502). **Metabolism of 2-[methoxy(methylthio)phosphinylimino]-3-ethyl-5-methyl-1,3-oxazolidine in the cotton plant and houseflies.** *Pestic. Biochem. Physiol. 2(2): 162-169; 1972.* (10 references)

The new insecticide, 2-[methoxy(methylthio)-phosphinylimino]-3-ethyl-5- methyl-1,3-oxazolidine (R-16,661) was only slowly metabolized in cotton plants treated at the base with 37.5 mg of the phosphorus-labeled compound. Approximately 90% remained unchanged after 14 days and similar results were obtained in cotton leaves exposed to a solution of the labeled insecticide. The principal metabolite was identified as the 4-keto derivative, a 4-hydroxy precursor was also tentatively identified. Penetration of R-16,661 into the housefly and metabolism of the compound were very slow. Unchanged R-16,661 was the major component and the 4-keto derivative was the principal metabolite. In vitro metabolism by housefly and mosquito larvae homogenates yield the same derivative. Mouse liver microsome plus soluble fraction had a metabolic pattern practically identical to that of the cotton plant, as did the Udenfriend model oxidation system. The 4-keto metabolite of R-16,661 was about 10-fold less effective as an inhibitor of insect and mammalian ChE and was 15-fold less toxic to the housefly. However, R-16,661 and the 4-keto compound were of approximately equal toxicity to the mouse, having LD50s of 0.1 to 0.2 and 0.4 to 0.6 mg/kg, respectively.

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73-0419. Fuchs, A.; Van Den Berg, G. A.; Davidse, L. C. (Lab. of Phytopathol., Agr. Univ., Wageningen, The Netherlands). **A comparison of benomyl and thiophanates with respect to some chemical and systemic fungitoxic characteristics.** *Pestic. Biochem. Physiol. 2(2): 191-205; 1972.* (30 references)

In vitro transformation rates (T) of benomyl and thiophanates were dependent on pH and temperature and decreased in the order. T benomyl > T NF48 > T thiophanate methyl > T thiophanate. All four compounds were converted to benzimidazole carbamic acid, methyl ester (BMC), or its ethyl ester analog (BCE). Benomyl sensitive strains of fungus were sensitive to the thiophanates and to all conversion products of the parent compounds while benomyl resistant strains were not affected by any of them. This and other evidence suggests that BCM and BCE are the common fungitoxic compounds. The order of concentrations (C) found in aerial parts of plants which had had their roots exposed to fungicide solutions for two days did not correspond to the order of transformation rates nor did the order of effectiveness of the compounds as fungitoxicants. No appreciable protection from fungal attack was observed following exposure to heated solutions of the compounds although in vitro fungitoxic activity increased, probably due to differences in the uptake and distribution of BCM.

73-0420. Leesch, J. G.; Fukuto, T. R. (Dept. of Entomol., Div. of Toxicol. and Physiol., Univ. of California, Riverside, CA 92502). **The metabolism of Abate in mosquito larvae and houseflies.** *Pestic. Biochem. Physiol. 2(2): 223-235; 1972.* (22 references)

Since insecticide selectivity is becoming more and more important, the toxicity of Abate and of its oxidation products was investigated in mosquito larvae and in adult houseflies. Only Abate (LD50 250 μg/g) was appreciably toxic to the housefly. In mosquito larvae

Abate (LC50 6.3 X 10^{-3} ppm) was more effective than its analogs, and toxicity decreased with increasing oxidation state and polarity, suggesting that absorption of the toxicant may strongly influence effectiveness. No obvious relationship was obtained between toxicity and anticholinesterase activity of the PO esters. The rate of absorption of Abate from a water medium was higher in mosquito larvae than with housefly after topical application. Mosquito larvae were able to convert more of the compound to PO esters.

73-0421. Lucier, G. W.; McDaniel, O. S.; Williams, C.; Klein, R. (Nat. Inst. of Environ. Health Sci., Nat. Inst. of Health, Research Triangle Park, NC 27709). **Effects of chlordane and methylmercury on the metabolism of carbaryl and carbofuran in rats.** *Pestic. Biochem. Physiol. 2(2): 244-255; 1972.* (29 references)

Pretreatment of male rats with 10 mg/kg/day methylmercuric hydroxide (MMH) for two days decreased the metabolism of labeled carbaryl or carbofuran by hepatic microsomes two to three times, and reduced the amount of cytochrome P 450 and the activity of enzymes dependent on it in the liver. Chlordane pretreatment (20 mg/kg/day for two days) induced oxidative metabolism of carbaryl and carbofuran nearly two fold. Simultaneous administration of MMH and chlordane resulted in a metabolism just slightly less than that of controls. A marked increase in urinary excretion of carbofuran-^{14}C equivalents was observed in chlordane treated animals. Surprisingly, a 12% increase was observed with MMH–treated animals. Similar results were obtained for the excretion of carbaryl and its metabolites although the effects were not as marked. Microsomal or urinary carbamate metabolites were not qualitatively altered by chlordane and MMH pretreatment.

73-0422. Kar, P. P.; Matin, M. A. (Industrial Toxicol. Res. Cent., Chattar Manzil Palace, Lucknow, U. P., India). **Central effect of lignocaine in organophosphate convulsions.** *Pharmacol. Res. Commun. 4(1): 37-41; 1972.* (13 references)

Lignocaine (4mg/kg, i.v.) controlled convulsions and tremors induced by DFP or paraoxon but did not alter the increases in brain ACh in rats. Brain ACh levels were 4.95 and 4.18 μg/g in paraoxon and DFP treated animals and 2.81 μg/g in controls. Paraoxon and DFP treated animals which were given lignocaine 20 min after administration of the pesticides had brain ACh levels of 5.03 and 4.11 μg/g, respectively. Control animals treated with lignocaine had a level of 2.8 μg/g ACh. The anticonvulsant effect of lignocaine may result from its direct depression of neuronal activity.

73-0423. Basson, N. C. J. (Plant Protection Res. Inst., Pretoria, Republic of S. Africa). **Effect of dieldrin and its photoisomerization product 'photodieldrin' on birds.** *Phytophylactica 3(3): 115-124; 1971.* (14 references)

The oral toxicity of technical dieldrin, its photoisomerization product, and a combination of both compounds to three species of birds was as follows: guineafowl: dieldrin > dieldrin plus photodieldrin > photodieldrin; doves: photodieldrin, >, dieldrin plus photodieldrin > dieldrin; sparrows: dieldrin plus photodieldrin > photodieldrin > dieldrin. In guineafowl the period between initial symptoms of intoxication and death increased with increasing doses, suggesting that this bird can distinguish between contaminated and uncontaminated feed. A similar but less pronounced effect was observed in doves, but not in sparrows. There were no sex differences. The deposits of dieldrin initially (17 ppm) and of dieldrin (5.5 ppm) and photodieldrin (7.1 ppm) on the sixth day after spraying for termite control were not considered hazardous to guineafowl and sparrows, judged by results of this study. Although dieldrin plus photodieldrin presents a theoretical hazard to doves, field observations did not reveal signs of intoxicated birds.

73-0424. Komissarenko, V. P.; Gordiyenko, V. M.; Reznikov, A. G. (Kiev Sci. Res. Inst. of Endocrinol. and Metabolism, Min. of Pub. Health of the Ukraininan SSR, Kiev, USSR). **Vosstanovitel'nyye protsessy v kore nadpochechnikov sobak posle vvedeniya *o,p'*-DDD. [Restorative processes in the adrenal cortex of dogs following administration of TDE.]** *Probl. Endokrinol. 18(3): 74-81; 1972.* (13 references) (Russian)

The structural and functional restoration of the adrenal cortex of dogs was studied following administration of TDE in 50 mg/kg daily doses for 10 days. The blood hydrocortisone level normalized in 2-3.5 months, but the corticosteroid response to ACTH remained weak for 5-9 months. A partial restoration of the adrenocortical function was caused by intensified proliferation of parenchymal cells. The atrophic and destructive processes within the cellular elements of the adrenal cortex were partially reversible. Histological and histochemical studies revealed severe functional stress on the secretory cells.

73-0425. Johnston, J. M. (Int. Pacific Salmon Fisheries Commission, New Westminister, British Columbia, Canada). **Tolerance of juvenile sockeye salmon and zooplankton to the selective squawfish toxicant 1,1-methylenedi-2-naphthol.** *Progr. Fish Cult. 34(3): 122-125; 1972.* (11 references)

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not genetic or racial source of the fish, influenced the tolerance of juvenile sockeye salmon to Squoxin. The maximum LC0 for sockeye fingerlings with costiasis was 0.30 ppm. One wk after treatment of the disease LC0 had returned to the normal 0.70 ppm. No mortalities occurred among 10 species of zooplankton exposed for seven days to concentrations of Squoxin ranging from 0.008 to 0.10 ppm at 12.8°.

73-0426. Bhargava, V. (Med. Res. Council, Neuropsychiatry Res. Unit, Carshalton, England). **Effect of diisopropyl phosphorofluoridate (DFP) on the somatosensory evoked potentials in rats.** *Psychopharmacologia 25(4): 376-379; 1972.* (8 references)

Approximately 20 to 30 min following application of DFP to the cortex of rats, measurement of somatosensory evoked potentials revealed a significant increase in the amplitude of repetitive afterdischarges becoming regular in frequency. No consistent effect was observed on the short latency positive-negative waves. Concentrations of 2×10^{-4} *M* often completely depressed the evoked potentials and sometimes caused the death of the animal. Apparently the afferent pathways responsible for the repetitive discharges involve cholinergic synapses.

73-0427. Rickett, F. E.; Tyszkiewicz, K.; Brown, N. C. (Cooper Technical Bureau, Berkhamsted, Herts, England). **Pyrethrum dermatitis part I: the allergenic properties of various extracts of pyrethrum flowers.** *Pyrethrum Post 11(3): 85-89; 1972.* (13 references)

Pyrethrum flowers were extracted with hexane, methylene chloride, and methanol, or with hexane, normal saline, 25% sodium thiocyanate, and 50% aqueous dioxane. The extracts were tested for immediate and delayed hypersensitivity reactions in guinea pigs previously sensitized to pyrethrum. High molecular weight, non-dialyzable substances in saline extracts produced strong reactions. Higher concentrations of the saline extracts produced an area which remained pink in the center of the Evans blue marked spots, possibly because of a rapid reaction to the antigen causing local vasoconstriction. A moderate reaction occurred with the hexane extract in both immediate and delayed tests.

73-0428. Elliott, M.; Janes, N. F.; Casida, J. E.; Kimmel, E. C. (Dept. of Insecticides and Fungicides, Rothamsted Exp. Station, Harpenden, Hertfordshire, England). **Mammalian metabolites of pyrethroids.** *Pyrethrum Post 11(3): 94-103; 1972.* (11 references)

NMR and MS analysis were used to deduce the structures of metabolites formed by rats from pyrethrin I, pyrethrin II, and allethrin. *Trans*-methyl groups in pyrethrin I and allethrin were oxidized to the carboxyl, and in pyrethrin II, the methoxycarbonyl group of the acid side chain was rapidly hydrolyzed to the free acid. The methyl group was less easily attacked. The next step in the series of detoxification reactions of the common intermediates of pyrethrins I and II occurred at the terminal double bond, resulting in the formation of a *cis*-pent-2-enyl-4,5-diol or a *trans*-pent- 3-enyl-2,5-diol or an ester of the 4,5-diol with an aromatic acid at the 4-hydroxyl group. Hydrolysis of the central ester link, before or after oxidation of the *trans* methyl group of the acid was involved in the reactions of allethrin, but not pyrethrins I and II. A 2,3-diol or a 1-hydroxy-prop-2-enyl were the products of oxidation of the allylic side chain of allethrin. In a third metabolite one methyl group on the cyclopropane ring was hydroxylated with the alcohol moiety unchanged. Metabolites in the feces were the same as those in the urine. Low mammalian toxicity of pyrethroids is probably related to their susceptibility to oxidative attack. Pyrethrin I was more toxic and more persistent than pyrethrin II.

73-0429. Reyes, H. B. (Dept. de Med. Experimental (Area Oriente), Fac. de Med., Univ. de Chile, Santiago de Chile, Chile). **Influencia de las proteinas ligantes Y y Z, en la captacion hepatica de bilirubina y otros aniones organicos. [The role of cytoplasmic Y and Z proteins in the uptake of bilirubin and other organic anions by the liver.]** *Rev. Med. Chile 99: 680-686; 1971.* (25 references) (Spanish)

The mechanism of liver function as a key organ in the metabolism and excretion of endogenous and exogenous compounds is reviewed. Recent findings referring to certain proteins called Y and Z, present in the hepatocytic cytoplasm, are discussed in terms of their role in the rate and selectivity of bilirubin and other organic anion (DDT and dieldrin) uptake by the liver. Decrease in serum bilirubin levels after administration of DDT, phenobarbital, or other drugs in neonatal jaundice or in patients affected by Gilbert's syndrome is interpreted as a drug-related increase of the Y protein level in the hepatocyte. Administration of dieldrin, DDT, and other compounds to rats increased the concentration of Y protein in the liver. The compounds also increased the rate of disappearance of simultaneously administered bromosulfophthalein i.v. from the plasma.

73-0430. Gzhegotskiy, M. I.; Doloshitskiy, S. L.; Martynyuk, N. V. (Lvov Med. Inst., Lvov, USSR). **Toksichnost nekotorykh gerbitsidov dlya ryb. [Toxicity of some herbicides to fish.]** *Ryb. Khoz. (Kiev) 8: 27-28; 1971.* (Russian)

The acute and chronic toxicity of propazine, Pyramin (pyrazon), celatox, Alicep (pyrazon plus chlorbufam), Avadex (diallate), and Carbyne (barban) were studied on crucian carp and guppies. Concentrations of 50.0 ml of propazine, Pyramin, celatox, and Alicep and of 5.0 ml of Avadex and Carbyne per liter caused death of all fish in 2.5-18 hr in an acute poisoning test. Minimum lethal concentrations (10.0 ml of propazine and Pyramin, 2.5 ml of celatox, 5.0 ml of Alicep, 1.0 ml

of Avadex, and 0.5 ml of Carbyne per liter) caused death of some fish by the end of the second month of the experiment. The no-effect concentrations, determined in a three months' experiment, were 1.0 ml of propazine and Pyramin, 0.5 ml of celatox and Avadex, 0.2 ml of Alicep, and 0.1 ml of Carbyne per liter. Cooked fish from this experiment had normal organoleptic properties. The results indicate high toxicity of the above herbicides under both acute and chronic poisoning conditions.

73-0431. Nishimura, M.; Kondo, T.; Maehashi, H.; Tanaka, H.; Kaneko, Y. (Sch. of Hyg., Tokyo Dental Coll., Tokyo, Japan). **[Inhalation toxicity of agricultural pesticides (series 1). Inhalation toxicity of 3,4-dimethylphenyl *N*-methylcarbamate (MPMC) in rabbits.]** *Sangyo Igaku (Jap. J. Ind. Health) 14(5): 441-448; 1972.* (13 references) (Japanese)

MPMC (meobal) is generally applied to rice fields in Japan by workers hand-carrying the "pipe duster" sprayers. Thus the risk of inhalation is appreciable. The inhalation toxicity of meobal was assessed by placing caged rabbits at various intervals along a 40-m pipe duster in a closed room. Meobal dust was released intermittently. No appreciable decrease in rabbit plasma cholinesterase was found after exposure to 20 mg/m^3 for 30 min whereas a 26% inhibition was found at a concentration of 39 mg/m^3. Exposure to 20 mg/m^3 for 30 min, followed by 0.6 mg/m^3 for 60 min caused a 21% inhibition, and exposure to 39.6 mg/m^3 for 30 min and 8.4 mg/m^3 for 60 min caused a 40% inhibition. The cholinesterase level normalized spontaneously within 2 hr after the end of exposure in all cases studied. Feeding and activity were also depressed during the period of cholinesterase inhibition. The maximum dust concentration occurred at the tip of the pipe duster. Dust collection with impingers gave higher values than collection with conventional dust collectors.

73-0432. Elgart, M.; Higdon, R. S. (Dept. of Dermatol., George Washington Univ. School of Med., Washington, DC). **Canine scabies: report of a family outbreak.** *S. Med. J. 65(3): 375-376; 1972.* (10 references)

A family of four was treated with lindane (Kwell lotion) for canine scabies acquired from an infested puppy. A dramatic improvement in their symptoms was observed within 48 hr. Since canine scabies mites do not burrow in human skin and reproduce, the diagnosis was difficult, and examination of the pet was necessary to confirm the diagnosis. The characteristic sign was a papular eruption on the anterior surface of the body, and the children, who were in closer contact with the dog, had more severe infestation. The dog was treated with chlordane dip.

73-0433. Worden, A. N.; Noel, P. R. B.; Mawdesley-Thomas, L. E. (Huntingdon Res. Cent., Huntingdon, England). **Effects of ronnel after chronic feeding to dogs.** *Toxicol. Appl. Pharmacol. 23(1): 1-9; 1972.* (16 references)

Ronnel, *O,O*-dimethyl-*O*-(2,4,5-trichlorophenyl) phosphorothioate, was subjected to a toxicity study lasting two yr in the dog. Throughout the period there were not any overt clinical signs that could be attributed to ronnel, and body weight did not appear to be affected even at the high level of intake of 10 mg/kg/day. There was no evidence of any effect of ronnel upon urinalysis, hematologic findings, blood biochemical findings (other than a depression of plasma cholinesterase), organ weights, or the histologic appearance of the tissues. Ronnel was without adverse effect upon erythrocyte cholinesterase or brain cholinesterase. Depression of plasma cholinesterase was the only noteworthy effect observed in the study. Depression was significant at the 10 mg/kg/day dietary level ($P = 0.01$), but was only slight at the intermediate 3 mg/kg/day level ($P < 0.05$). Dogs in the intermediate group had plasma cholinesterase values which, overall, averaged 82% of pretreatment controls. Plasma cholinesterase values for the 1 mg/kg/day level were indistinguishable from those of controls. The unequivocal no-effect level of ronnel in dogs is concluded to be 1 mg/kg/day. However, considering that no other effects were observed in the study and that depression of plasma cholinesterase was generally within a 20% variation from preteatment values, it is concluded that 3 mg ronnel/kg/day produced no significant toxicologic effect in dogs. (Author abstract by permission)

73-0434. Pekas, J. C. (U.S. Dept. of Agr., Animal Sci. Res. Div., Agr. Res. Service, Metabolism and Radiation Res. Lab., Fargo, ND 58102). **Intestinal hydrolysis, metabolism and transport of a pesticidal carbamate in pH 6.5 medium.** *Toxicol. Appl. Pharmacol. 23(1): 62-70; 1972.* (8 references)

The metabolism and transport of (1-naphthyl-1-^{14}C) *N*-methyl-carbamate by everted sacs of rat small intestine in pH 6.5 medium were remarkably different from those reported for a pH 7.4 medium. Active liberation of naphthol from the carbamate by the intestine was demonstrated, and the rate of hydrolysis was greater in cranial than in mid or caudal intestine. Water-soluble ^{14}C-metabolites were also synthesized more rapidly in cranial than in mid or caudal intestine. The major ^{14}C-metabolite cochromatographed with naphthyl glucuronide, previously found to be the major metabolite in pH 7.4 medium. Net mucosal-to-serosal transfer of ^{14}C occurred throughout the intestine but was most rapid in the cranial section. The serosal:mucosal concentration gradient of the water-soluble ^{14}C-metabolites was greatest in the caudal section. (Author abstract by permission)

73-0435. Neal, R. A. (Cent. in Environ. Toxicol., Dept. of Biochem., Vanderbilt Univ. Sch. of Med., Nashville,

TN 37203). **A comparison of the in vitro metabolism of parathion in the lung and liver of the rabbit.** *Toxicol. Appl. Pharmacol. 23(1): 123-130; 1972.* (15 references)

Varying concentrations of parathion were incubated with microsomes isolated from the lung and liver of untreated, phenobarbital-treated, and 3-methylcholanthrene-treated rabbits and the rates of formation of paraoxon and diethyl phosphorothioic acid determined. From these data the *Km* and *Vmax* values were determined. The results indicate the *Km* values for formation of paraoxon and diethyl phosphorothioic acid are significantly lower using microsomes isolated from lung as compared to liver. The *Vmax* values for the formation of these two metabolites using microsomes isolated from lung are about 20% the values obtained using microsomes isolated from the liver. This difference in activity is most likely due to a smaller concentration of mixed function oxidase enzymes in the lung. The mixed function oxidase activity toward parathion in rabbit liver was induced by both phenobarbital and 3-methylcholanthrene. However, the mixed function oxidase activity toward parathion in the rabbit lung could be induced only by pretreatment with phenobarbital. The implications of metabolism of parathion to paraoxon in the lungs and the liver as it pertains to the toxicity of parathion are discussed. (Author abstract by permission).

73-0436. Hackenberg, U. (Inst. fuer Ind. und Biol. Forsch., Cologne, DDR). **Chronic ingestion by rats of standard diet treated with aluminum phosphide.** *Toxicol. Appl. Pharmacol. 23(1): 147-158; 1972.* (14 references)

Phosphine-releasing tablets composed of aluminum phosphide and ammonium carbamate have been used worldwide in the fumigation of cereal grains and other agricultural products. Previous toxicologic studies did not indicate any hazard in consuming phosphine treated diets; furthermore, no cumulative poisoning effects of phosphine could be detected. The study reported herein is of longer duration and deals with more animals and test criteria compared with previous experiments. Albino rats were fed for two yr a diet exposed to high concentrations of phosphine-releasing Phostoxin pellets. Behavior, general appearance, survival, body weight, food consumption, hematology, blood chemistry, urine analyses, and bone smear data, as well as gross and microscopic findings and rate of tumor development, did not reveal any toxic effects from the Phostoxin treated diet. (Author abstract by permission)

73-0437. Smith, M. T.; Thomas, J. A.; Smith, C. G.; Mawhinney, M. G.; Lloyd, J. W. (Dept. of Pharmacol., W. Virginia Univ. Med. Cent., Morgantown, WV 26506). **Effects of DDT on radioactive uptake from testosterone-1,2-^{3}H by mouse prostate glands.** *Toxicol. Appl. Pharmacol. 23(1): 159-164; 1972.* (13 references)

Orally administered technical grade DDT (12.5, 25, or 50 mg/kg) was studied in intact male mice and in intact and ovariectomized female mice. Regardless of the dose of DDT, there was a significant reduction ($P < 0.05\%$) in the prostate gland's ability to assimilate radioactive testosterone. The mechanism(s) of inhibitory action of DDT upon male sex accessory glands did not appear to be due to its reported inherent estrogenicity. Single po doses of DDT-^{3}H revealed considerable amounts of radioactivity localized in several male reproductive organs. The prostate and the testes exhibited significant amounts as early as 1 and 2 hr post-administration. Epididymal fat pads retained amounts of radioactive pesticide as long as 12 days after DDT-^{3}H ingestion. (Author abstract by permission)

73-0438. Stevens, J. T.; McPhillips, J. J.; Stitzel, R. E. (Dept. of Pharmacol., W. Virginia Univ. Med. Cent., Morgantown, WV 26506). **In vitro enhancement of aniline metabolism by paraoxon.** *Toxicol. Appl. Pharmacol. 23(2): 208-215; 1972.* (17 references)

Paraoxon in concentrations from 2×10^{-5} *M* to 1×10^{-3} *M* enhanced the in vitro microsomal metabolism of aniline in livers obtained from rats, mice, rabbits, dogs, and man. Paraoxon is several thousand times more potent as an enhancing agent than acetone. Enhancement of drug metabolism by acetone is inhibited by SKF 525A, but enhancement of metabolism by paraoxon is relatively unaffected by this agent. Furthermore, the kinetic constants differ, suggesting that the mechanisms by which these agents produce enhancement are different. Hexobarbital and ethylmorphine metabolism were inhibited by paraoxon. Metabolism of paraoxon itself did not appear to play a major role in the mechanism of the enhancement. Short term in vivo pretreatment of mice with paraoxon also resulted in the enhancement of aniline metabolism in vitro. (Author abstract by permission)

73-0439. Collins, T. F. X. (Div. of Toxicol., Food and Drug Admin., Dept. of Health, Educ., and Welfare, Washington, DC 20204). **Effect of captan and triethylenemelamine (TEM) on reproductive fitness of DBA/2J mice.** *Toxicol. Appl. Pharmacol. 23(2): 277-287; 1972.* (20 references)

The specific mammalian mutagen bioassay system involving polygenic reproductive fitness was tested by using two generations of the offspring of captan treated male DBA/2J mice. The fungicide captan (*N*-(trichloromethylthio)tetrahydrophthalimide) was given at doses of 50 or 100 mg/kg/day for five days. The known mutagen triethylenemelamine (TEM) was used as the positive control compound (0.1 mg/kg dose). TEM produced decreases in overall productivity (as measured by the fertility index) and decreased survival from birth to day four and from day five to weaning at 21 days. Captan treated animals also showed a decrease in fertility index,

but neither dose of captan provoked the severity of decreases seen after TEM treatment. The decrease in average weaning weight seen in the first litter of the second generation after the high dose of captan suggests that the effects of captan on certain characteristics may be nearly as serious as those of TEM. (Author abstract by permission)

73-0440. Macek, K. J.; Walsh, D. F.; Hogan, J. W.; Holtz, D. D. (Fish-Pesticide Res. Lab., U.S. Bureau of Sport Fish. and Wildl., Columbia, MO). **Toxicity of the insecticide Dursban to fish and aquatic invertebrates in ponds.** *Trans. Amer. Fish. Soc. 101(3): 420-427; 1972.* (17 references)

Dursban (chlorpyrifos) applied to experimental ponds at 0.05 or 0.01 lb/A, rates recommended for mosquito control, was toxic to bluegills and largemouth bass. Cumulative mortality among controls was about 1% while at the lower rate 3% and 10% mortalities were observed for bluegills and bass, respectively. At the higher rate the values were 55% for bluegills and 46% for bass. With largemouth bass mortality was higher after the second dose, applied later in the summer, indicating a possible temperature effect. Both species from ponds treated at 0.05 lb/A had more than an 80% reduction in brain AChE activity and had not regained normal AChE activity 28 days after application. Parasite induced changes in organs of the fish could have masked damage due to Dursban. There was no conclusive evidence of pesticide induced pathology. Maximum residues were 3.82 ppm in bluegills and 2.55 ppm in bass found 1 to 3 days after initial exposure. Applications of 0.05 lb/A of Dursban markedly reduced the total number of insects colonizing the plate samplers. The results indicate that it is inadvisable to apply Dursban at the suggested rates in aquatic habitats where fishery resources are protected.

73-0441. Coppage, D. L. (U.S. Environ. Protect. Agency, Gulf Breeze Lab., Sabine Island, Gulf Breeze, FL 32561). **Organophosphate pesticides: Specific level of brain AChE inhibition related to death in sheepshead minnows.** *Trans. Amer. Fish. Soc. 101(3): 534-536; 1972.* (10 references)

Inhibition of brain AChE was studied in sheepshead minnows during static exposures to acute doses of organophosphates. Lethal doses of Guthion (azinphosmethyl), phorate, and parathion reduced AChE activity to 17.7% of normal for 24 hr preceding death with 48 and 72 hr exposure, and for 18 hr before death with 24 hr exposure. Death in all lethal exposures occurred at AChE levels ranging from 0 to 15.4% of normal. Sublethal concentrations in 120 hr tests lowered activity to 17.7-22% of normal. Phosphamidon, Cygon (dimethoate), malathion, EPN, Dursban, dichlorvos, diazinon, Dibrom (naled), and methyl parathion, at concentrations chosen to kill 40 to 60% of the fish, reduced the AChE activity to below 17.7% of normal, indicating impending death. The results suggest that levels of brain AChE inhibition in fish can be useful indicators of organophosphate exposure.

73-0442. Nimmo, D. R. (Environ. Protect. Agency, Gulf Breeze Lab., Sabine Island, Gulf Breeze, FL 32561). **Effects of DDT on cations in hepatopancreas of penacid shrimp.** *Trans. Amer. Fish Soc. 101(3): 547-549; 1972.* (12 references)

Exposure of living shrimp to concentrations of 0.05 to 0.10 ppb DDT for up to 30 days resulted in depression of concentrations of some cations in the hepatopancreas. Sodium and potassium were lowered significantly at the 0.1 ppb level of DDT and at the 0.05 ppb level on the 20th day. Magnesium was not significantly affected. Levels of other cations were too low to be accurately measured. The most probable explanation is that DDT interferes with ATPase involved in active transport of cations into the hepatopancreas, resulting in a failure to balance the normal efflux. No significant differences were observed in ratios of the wet, dry, or ashed wt of the hepatopancreas and the original length or wet wt of the shrimp, or in relative amounts of each cation and the wet wt of the shrimp, or in the ratio of cations.

73-0443. Allegrini, J.; Bouchberg, M. S. de; Zuccarelli, M.; Soulie, B. (Lab. de Microbiol., Fac. de Pharm., Montpellier, France). **Etude de la toxicite de trois types de pesticides sur quelques bacteries actives dans l'epuration biologique des eaux usees. [Study of the toxicity of three different types of pesticides to some bacteria involved in the biological purification of waste waters.]** *Trav. Soc. Pharm. Montpellier 32(1): 65-74; 1972.* (7 references) (French)

The effects of three types of pesticides (DDT, Dursban (chlorpyrifos), and carbaryl) on the growth and survival of 16 different strains of bacteria were studied. The minimum effective inhibitory concentrations were high, ranging from 200 to 1,600 ppm for both DDT and Dursban, and from 100 to 1,600 ppm for carbaryl. The minimum inhibitory concentration of Dursban for *Enterococcus (liquefaciens)* was less than 25 ppm. A considerable increase was observed with increasing contact time in the bacteriostatic and bactericidal power, even with initially ineffective pesticide concentrations. The minimum effective inhibitory concentration decreased sharply during a second exposure. DDT in 10 ppm concentration decreased the percentage of surviving bacteria to 80 from 100% after two weeks' treatment. The corresponding percentages for 10 ppm, 1 ppm, and 0.1 ppm concentrations of Dursban were 30, 50, and 80%. Carbaryl in concentrations of 1 and 0.1 ppm reduced the percentage of surviving bacteria to 50%. None of the pesticides in 0.01 ppm concentration affected the survival of the bacteria.

73-0444. Sedokur, L. K. (All-Union Res. Inst. Hyg. and Toxicol. of Pestic., Polymers, and Plastics, Kiev, USSR). **Vplyv pokhidnykh dytiokarbaminovoy kysloty na nukleyinovi kysloty pechinky shchuriv. [Rat liver nucleic acids as affected by dithiocarbamic acid derivatives.]** *Ukr. Biokhim. Zh. 43(4): 511-514; 1971.* (21 references) (Ukrainian)

Intragastric administration of TMTD (thiram) to rats in daily amounts ranging from 5.0 to 200.0 mg/kg body weight produced dose-dependent shifts in the liver nucleic acids leading to decreased DNA and increased RNA levels. These shifts were associated with decreased soluble liver protein levels and were prevented by concomitant thymidine treatment. Thiram appears to interfere in the *de novo* synthesis of pyrimidines by blocking the UTP → TTP reaction catalyzed by thymidylsynthetase. The increased RNA levels might also be due to the activating effect of thiram on DNA-depolymerase. The drop in soluble protein levels is probably caused by alterations of the genetic information transcription process and by the thiram-generated metabolites which interact with biologically active compounds and interfere with the cytoplasmic protein biosynthesis processes.

73-0445. Palmer, J. S. (Vet. Sci. Res. Div., Agr. Res. Serv., Toxicol. Res. Lab., Kerrville, TX 78028). **Toxicity of 45 organic herbicides to cattle, sheep, and chickens.** *U.S. Dept. Agr. Production Research Report No. 137, Washington, 1972, pp.1-41.* (5 references)

The toxicity of 45 organic herbicides was studied in cattle, sheep, and chickens after repeated doses were administered in gelatin capsules or as aqueous solutions by drench or pipette. The test period lasted 10 days or until toxicological effects appeared. The most frequently observed signs of toxicity were anorexia and weight loss or reduced weight gains. Digestion was often impaired by congestion or redness of the intestinal mucosa. Necropsy revealed wide variations in macroscopic lesions. Prominent and distended cranial vessels were often associated with ataxia and depression before death. Liver and kidney were frequently affected. To evaluate the hazard to cattle, sheep, and chickens, an arbitrary yield of forage and rate of consumption were selected which represented the most severe conditions of use, and no correction was made for possible degradation of the compound. It was found that the most frequently used or moderate rates of application of a number of herbicides would not present a hazard while maximum rates of some equaled or surpassed a hazardous concentration in at least one species. Normal application rates of Erbon, chlorpropham, dinoseb, 2,4-DEP, propachlor, and DMPA would be hazardous to all three species studied.

73-0446. Fedorenko, A. P.; Antipchuk, Yu. P.; Rogatko, I. V. (Inst. of Zoology, Acad. of Sci. USSR, Moscow, USSR). **Nekotoryye morfo-fiziologicheskiye i biokhimicheskiye izmeneniya u mlekopitayushchikh vyzvannyye deystviyem insektitsidov v usloviyakh eksperimenta. [Some insecticide-induced morphological, physiological, and biochemical changes in mammals occurring under experimental conditions.]** *Vestn. Zool. 5(6): 49-54; 1971.* (17 references) (Russian)

Morphological, physiological, and biochemical alterations due to oral doses of DDT, BHC, and trichlorfon were studied in *Microtus arvalis* Pall., *M. socialis* Pall., and *Oryctolagus cuniculus* L. The animals were fed a diet containing the above insecticides for 6-7 days. DDT caused catarrhal and hemorrhagic inflammation of the gastric mucosa, hepatomegaly, hyperemia of the liver and the lung, hemorrhages of the tunica serosa in the bladder, and frequent cardiac enlargement. Proliferation of Kupffer's cells in the liver and of glomerular endothelial cells, proteic dystrophy of the kidney, and damaged epithelium of some testicular tubules were observed. The above alterations were less pronounced in animals treated with BHC while trichlorfon induced no pathological changes. All three insecticides caused decreases in all hematological parameters in voles; BHC slightly increased the erythrocyte count. Reduced erythrocyte count and hemoglobin level, and increased leukocyte count were observed in rabbit due to DDT and trichlorfon. The respiration rhythm of rabbit was increased by DDT and reduced by trichlorfon while the alteration in the pulse frequency was not significant. Investigations of the blood serum proteins in voles poisoned with DDT or BHC revealed increased alpha-1 and beta-1 globulin and decreased albumin and alpha-2 globulin fractions. Trichlorfon decreased alpha-2 and beta-2 globulins and increased alpha-1 and gamma globulins. Increased beta globulin and lowered alpha globulin levels were measured in rabbit. The findings suggest that morphological, physiological, and biochemical changes indicate early stages of poisoning.

73-0447. Poloz, D. D.; Trondina, G. A. (All-Union Inst. of Exp. Vet. Med. Moscow, USSR). **Raspredeleniye metilnitrofosa v tkanyakh kur i dinamika yego vydeleniya pri ostrom otravlenii. [The distribution of methylnitrophos in the tissues of chicken and the dynamics of its elimination under acute poisoning conditions.]** *Veterinariya (Moscow) 48(1): 73-74; 1972.* (Russian)

The distribution in the tissues and the dynamics of the elimination of methylnitrophos (fenitrothion) were studied in chickens treated with single oral doses of 600, 445, and 300 mg/kg. The elimination with the excrement was most intense 7-8 hours after poisoning and completed in eight days. A metabolite of methylnitrophos, *p*-nitrocresol, was also present in the excrement. The methylnitrophos residue contents were highest in the liver, lung, heart, gizzard, kidney, and ovary while the blood, brain, and muscles contained reduced quantities. The elimination from the organs and tissues was completed in 6-27 days.

73-0448. Talanov, G. A.; Kurmanov, I. A. (All-Union Res. Inst. of Vet. Hyg., Moscow, USSR). **Antidototerapiya pri eksperimental-nom otravlenii krolikov. [Antidote therapy in the experimental poisoning of rabbit.]** *Veterinariya (Moscow) 48(4): 85-87; 1972.* (Russian)

The efficiency of atropine, phospholytin, and TMB-4 in the treatment of rabbits experimentally poisoned with organochlorine and organophosphorus pesticides was investigated. Atropine and phospholytin were fully effective for trichlorfon and DDVP (dichlorvos) provided they were administered prior to the development of bradycardia. Single doses of antidotes were ineffective in the treatment of poisonings with thiophosphoric and dithiophosphoric acid derivatives of slow anticholinergic action. A combination of phospholytin with TMB-4 was more efficient than atropine or phospholytin. Bronchospasms occurring in acute poisonings with DDVP and trichlorfon were effectively suppressed by intramuscularly administered TMB-4 in aqueous solution.

73-0449. Gajduskova, V. (Vyzkumny Ustav Veterinarniho Lekarstvi, Brno, Czechoslovakia). **Vylucovani 1-naftyl-*N*-metylkarbamatu (Karbarylu) a 2-izopropoxyfenyl-*N*-metylkarbamatu (Aprokarbu) mlekem. [Excretion of 1-naphthyl-*N*-methylcarbamate (carbaryl) and 2-isopropoxyphenyl-*N*-methylcarbamate (Aprocarb) in milk.]** *Vet. Med. 17(6): 337-341; 1972.* (14 references) (Czech)

The excretion rate of carbaryl and Aprocarb (propoxur) in the milk of cows given these insecticides was determined by a simple spectrophotometric method with a sensitivity of 0.025 mg/kg. The carbamates were administered to the cows per os as an aqueous suspension to give a carbaryl dosage of 0.6 or 0.3 mg/kg body weight or a propoxur dosage of 0.85 or 0.5 mg/kg. The concentrations of carbaryl in the milk on the third day after administration were 0.07 (higher-dosage group) and less than 0.025 mg/kg; on the sixth day excretion in the milk was maximal with 0.16 and 0.08 mg/kg respectively. On the eighth day cows in the higher-dosage group excreted 0.11 mg/kg and on the ninth day a value of 0.07 mg/kg was found in the milk of the lower-dosage group. No carbaryl was detectable in the milk on day 24 after administration. Propoxur was present on day 3 after administration at 0.05 mg/kg milk in the higher-dosage group and 0.025 mg/kg in the lower-dosage group; on day 6 at 0.13 and 0.16 mg/kg respectively; on days 8-9 at 0.22 and 0.03 mg/kg; and on day 24 at 0.05 and less than 0.025 mg/kg. Thus these insecticides cannot be considered suitable for use in controlling insect infestation of cattle fodder or for ectoparasite control during the lactation period.

73-0450. Vestweber, J. G.; Kruckenberg, S. M. (Dept. of Surg. and Med., Kansas Agr. Exper. Station, Kansas State Univ., Manhattan, KS 66502). **The effect of selected organophosphorous compounds on plasma and red blood cell cholinesterase in the dog.** *Vet. Med. Small Anim. Clin. 67(7): 803-806; 1972.* (13 references)

Red blood cell (RBC) and plasma cholinesterases were measured before and after administration of five organophosphates alone or in combination to dogs. Oral doses of trichlorfon depressed RBC ChE activity more than plasma ChE activity. Daily treatment depressed RBC activity to 8% of pretreatment value by the 8th day in one dog. Compound 4072 applied topically and Ronnel, given orally, primarily depressed plasma activity. Reduction of both activities was similar with malathion. Oral treatment with dichlorvos depressed RBC ChE gradually and plasma ChE acutely, and daily administration resulted in an RBC activity 10% of the control level in one dog. Combinations of the compounds did not have an additive effect on the depression of ChE activity. An equilibrium above 0 was established for ChE activity following repeated therapeutic doses of the organophosphates. Recovery was generally faster for plasma ChE than for RBC ChE, and levels higher than pretreatment levels were sometimes obtained. No clinical signs were observed in any of the dogs, although doses were administered more frequently than recommended.

73-0451. Stoyanov, Kh. (Inst. Biol. and Pathol. of Reproduction and Non-Infectious Dis., Sofia, Bulgaria). **V"rkhu nyakoy biokhimicheski promeni u pl"kove i ovtse pri akutno otravyane s kheptakhlor. [Biochemical alterations occurring in rats and sheep after acute poisoning with heptachlor.]** *Vet. Med. Nauki 8(6): 65-70; 1971.* (23 references) (Bulgarian)

Heptachlor administered to male white rats p.o. as a 40% solution in vegetable oil had an LD50 of 55 mg/kg body wt. Biochemical alterations observed 2 to 96 hr after administration of the compound included decreased whole blood cholinesterase activity and total cholesterol levels, liver and muscle glycogen, and lowered serum albumin levels. Blood sugar, α-and β-globulins increased while blood glycogen, total serum proteins, and γ-globulins remained the same. Single doses of heptachlor (60 mg/kg) administered (p.o. in water suspension) to sheep decreased blood cholinesterase activities along with lower total, bound, and free cholesterol levels. Serum β-, γ-, and α-globulin levels increased. Blood sugar, blood glycogen, and total serum protein levels did not change.

73-0452. Khudoley, V. V. (Laboratory of Carcinogens, N. N. Petrov Sci. Res. Inst. of Oncology of the USSR Min. of Pub. Health, USSR). **Eksperimental'nyye opukholy u ryb. [Experimental tumor induction in fish.]** *Vop. Onkol. 17(1): 87-94; 1971.* (105 references) (Russian)

Experiments on the effects of various chemical carcinogens in fish are reviewed. Hepatoma was induced

by DDT in liver. Pesticide residues were a potential cause of liver tumor in fish. Fish, being highly sensitive to carcinogens, can be successfully used as test animals in investigations of the carcinogenic effects of chemical substances.

73-0453. Makovskaya, Ye. I.; Shamray, P. F.; Grigor'yeva, N. N. (Dept. of Pathological Anatomy, Vinnitsa Medical Inst., Vinnitsa, USSR) **Strukturnyye i gistokhimicheskiye izmeneniya zhelez vnutrenney sekretsii pri otravlenii polikhlorpinenom. [Structural and histochemical changes of internal secretion glands during polychloropinene poisoning.]** *Vrach. Delo 2: 128-131; 1972.* (6 references) (Russian)

Structural and histochemical alterations in endocrine glands of mice, rats, and rabbits due to subchronic and chronic poisoning with daily oral polychloropinene (toxaphene) doses corresponding to one-tenth and one-fiftieth LD50 are described. Investigations of the adrenal gland revealed cells with granular cytoplasm in the cortex and reduced glycogen, succinate dehydrogenase, alkaline phosphatase, lipid, and chromaffin body levels. Pyknosis and lysis of cell nuclei, edema, focal hemorrhages, and focal necrosis in the cortex were observed after four months. Hyperfunction of the thyroid gland along with focal granular degeneration and necrotic alterations of the follicular epithelium and slightly edematous stroma were determined. The pancreas displayed disturbed hemodynamics in the form of polyemia, edematous stroma, and focal hemorrhages. Necrosis of islet cells was revealed in some cases. Dystrophy of the germinative epithelium cells of the testes after two months and frequent total absence of spermatozoa after four months were observed. Degeneration of the tubular epithelium with the presence of only Sertoli cells and single spermatogoniae were determined in some cases. Large numbers of collagen fibers, fibrocytes, and macrophages were detected in the interstitial tissue. Examinations of the hypophysis showed atrophic changes with reduced numbers of basophilic cells. Proliferation of connective tissue cells in perivascular areas was observed. The findings indicate that endocrine glands are highly sensitive to organochlorine compounds.

73-0454. Bookhout, C. G.; Wilson, A. J.; Duke, T. W.; Lowe, J. I. (Environ. Protect. Agency, Gulf Breeze Lab., Sabine Island, Gulf Breeze, FL 32561). **Effects of mirex on the larval development of two crabs.** *Water, Air, Soil Pollut. 1(2): 165-180; 1972.* (13 references)

Mirex at 0.01 to 10.0 ppb lengthened the duration of developmental stages and total time of development in the crab, *Rhithropanopeus harrisii.* Significant differences in survival were observed between control larvae and larvae exposed to each concentration of mirex; no megalopa in 10.0 ppb survived to the first crab stage. No mirex residue was detected in the 4th and 5th crab stages of *R. harrisii* which had been reared in 0.01 ppb of the pesticide. At a level of 0.1 ppb of the pesticide, residue absorption and concentration by the 4th and 5th stages was > 1000 X. *Menippe mercenaria* did not exhibit changes in the duration of developmental stages, but a larger percentage of extra 6th zoeal stages was observed at concentrations from 0.01 to 1.0 ppb. Survival was reduced by mirex in *M. mercenaria* to a greater extent than in *R. harrisii,* especially in the megalopa stage. Although increased sensitivity was dose dependent, mortality could have been due to the combined effects of mirex and DDT (and its metabolites) which were observed in later stages. Residues of 0.13 ppm and 0.24 ppm mirex were found in *M. mercenaria* reared in 0.01 ppb and 0.1 ppb mirex, respectively.

73-0455. Lohs, K. (Deut. Akad. der Wissenschaften zu Berlin, Forschungsstelle fuer Chem. Toxikol., Leipzig, DDR). **Toxikologische Konsequenzen der Chemisierung der Landwirtschaft und ihre Folgerungen fuer die Probleme des Nachweises sowie des entgiftenden Abbaues wichtiger Agrochemikalien. [Toxicologic consequences of the increasing use of chemicals in agriculture and their implications for the problems of detection and detoxification of important agrochemicals.]** *Wiss. Beitr. Martin-Luther Univ. Halle-Wittenberg 5: 147-157; 1971.* (9 references) (German)

The toxicologist has the dual task of discouraging unsafe use and encouraging the proper use of agrochemicals. Worldwide standards for environmental protection are being developed by United Nations organizations. Research organizations in individual nations will be needed to supply data for standard-setting and to monitor results. The most abundant source of information on acute and chronic human poisoning by agricultural chemicals has been the occurrence of accidental, suicidal, or homicidal poisonings. Three notable deficiencies in the toxicological information picture remain. The first is a simple means for early recognition of poisoning. The second is a means for wide dispersion of information on the treatment of poisoning. This is related to the third deficiency, the paucity of knowledge concerning the metabolization of pesticides by various organisms as well as their degradation under various conditions. Lacking this knowledge of metabolism, understanding of pathogenetic mechanisms will necessarily remain poor. Additional information on the biological consequences of the alkylating effects of organophosphates is urgently needed since animal experiments have indicated a carcinogenic potential for the low-toxicity organophosphates such as trichlorfon.

73-0456. Hutson, D. H.; Hoadley, E. C.; Pickering, B. A. (Shell Res. Ltd., Tunstall Lab., Sittingbourne, Kent, England). **The metabolism of *S*-2-cyanoethyl-*N*-[(methylcarbamoyl)oxy] thioacetimidate, an insecti-**

cidal carbamate, in the rat. *Xenobiotica 1(2): 179-191; 1971.* (5 references)

Rapid metabolism and elimination of *S*-2-cyanoethyl-*N*-(methylcarbomoyl) oxythio(1,2-^{14}C)acetimidate followed oral administration of the compound to rats. By 96 hr less than 5% remained in the gut, skin, and carcass. Urine contained 40% of the radioactivity which occurred as unchanged compound, the hydroxythioacetimidate derivative, and the *O*-sulfate and *O*-glucuronide of that derivative. About 8% of the dose was recovered as respired CO_2 and 35.9% as acetonitrile. The metabolites in rat were similar to those of the non-toxic *S*-2-cyanoethyl *N*-hydroxythioacetimidate in dog: unchanged thioacetimidate, its *O*-sulfate, and its *O*-glucuronide.

73-0457. Richardson, A.; Robinson, J. (Shell Res. Ltd., Tunstall Lab., Sittingbourne, Kent, England). **The identification of a major metabolite of HEOD (dieldrin) in human faeces.** *Xenobiotica 1(3): 213-219; 1971.* (7 references)

Feces obtained from seven men working in a plant manufacturing dieldrin were analyzed for metabolites of the insecticide. Thin layer chromatography of extracts indicated the presence of a compound similar to the 9-hydroxy derivative of dieldrin. Using electron capture GC and MS analysis, the presence of that derivative was confirmed. Oxidation and acetylation of the metabolites gave compounds with the same retention values as 9-keto-dieldrin and 9-acetoxy-dieldrin.

73-0458. Hutson, D. H.; Hoadley, E. C.; Pickering, B. A. (Shell Res. Ltd., Tunstall Lab., Sittingbourne Lab., Sittingbourne, Kent, England). **The metabolic fate of (vinyl-1-^{14}C)dichlorvos in the rat after oral and inhalation exposure.** *Xenobiotica 1(6): 593-611; 1971.* (14 references)

The mean values for excretion of radioactivity 24 hr after oral administration of (vinyl-1-^{14}C)dichlorvos in male rats were: CO_2 30%; urine 15.2%; and feces 2.5%. Residual radioactivity was unusually high for a vinyl phosphate insecticide. The approximate percentages of administered dose (0.99 mg) remaining after four days were: liver 5; gut 2; skin 8; and carcass 16. Liver residues were ^{14}C-glycine and ^{14}C-serine incorporated into protein. Of the nine urinary metabolites found, hippuric acid (8.3%), desmethyldichlorvos (10.9%), a dichloroethanol glucuronide (27%), and urea (3.1%) were identified. Hydrolytic and demethylation reactions were probably responsible for rapid detoxification of the pesticide. The dichloroacetaldehyde formed was partly reduced to dichloroethanol and excreted as the glucuronide then partly dechlorinated and incorporated into a 2-carbon biosynthetic pathway. Rates and routes of elimination and metabolism were similar in animals which inhaled dichlorvos. Intraperitoneal administration yielded a similar gross metabolic pattern, but the reduction of dichloroacetaldehyde to dichloroethanol and subsequent conjugation was much more predominant.

73-0459. Hutson, D. H.; Hoadley, E. C. (Shell Res. Ltd., Tunstall Lab., Sittingbourne, Kent, England). **The metabolism of [^{14}C-methyl]dichlorvos in the rat and the mouse.** *Xenobiotica 2(2): 107-116; 1972.* (23 references)

Following oral administration of [^{14}C-methyl]-labeled dichlorvos to rats and mice, excretion of radioactivity was rapid, occurring mostly from 0-24 hr, and similar in both species. From 58.8-64.6% was excreted in the urine and 14.4-18.5% expired in CO_2. Dimethyl phosphate was the major metabolite (64.4 - 77.1%) in both species. In mouse urine 24.7% of the radioactivity was due to desmethyldichlorvos. From earlier work rat urine contained approximately 3.5% desmethyldichlorvos. *S*-methyl-*L*-cysteine oxide, *S*-methyl-*L*-cysteine, methylmercapturic acid *S*-oxide, and several unidentified metabolites were also found in the urine, indicating that glutathione alkyl transferase was responsible for some of the dealkylation.

73-0460. Zazhivilov, A. G. (Belgorod-Dnestrovsk Central Regional Hospital, Belgorod-Dnestrovsk, USSR). **Vliyaniye yadokhimikatov na funktsiyu mertsatel'nogo epiteliya lyagushki. [Effect of pesticides on the function of the ciliated epithelium of the esophagus in frog.]** *Zh. Ushn. Nos. Gorl. Bolez. 32: 74-75; 1972.* (Russian)

The toxic effects of 14 pesticides from 9 different groups on the function of the ciliated epithelium of the esophagus were studied in frogs. After the pesticide was applied on the mucosa of the esophagus in a concentration recommended in practice, the time required for a piece of frog liver placed on the esophagus to cover a distance of 4 cm was measured. Considerable inhibition of the fibrillation of the cilia close to paralysis in some cases was observed due to all pesticides investigated. The time required for covering the 4 cm distance along the esophagus was on an average 62.7±0.9 sec. DNOC and ziram were most toxic; metaphos (methyl parathion), Paris green, Granosan, Agronal (phenylmercuric bromide), and copper sulfate were moderately toxic. Chlorine containing products such as trichlorfon and 7.5% and 5.5% dust of DDT as well as colloidal sulfur proved to be the least toxic of all pesticides tested. A relationship was found between the rate of inhibition of the function of the ciliated epithelium and the general toxicity of the pesticides.

See also
73-0266 **73-0272** **73-0283** **73-0293** **73-0314** **73-0335** **73-0493**

73-0461. Rusiecki, W.; Brzezinski, J.; Szutowski, M. (Dept. of Toxicol. and Forensic Chem., Med. Acad., Warsaw, Poland). **Fluorometric determination of phosphoroorganic insecticides.** *Acta Pol. Pharm. 28(4): 385-389; 1971.*

A method for the determination of dichlorvos and Dipterex (trichlorfon) has been developed which utilizes the formation of highly fluorescent transient oxidation products formed by the reaction of peroxyphosphoric acids with indole. The required amounts of solutions of indole and sodium perborate were mixed and added to an acetone solution of insecticide. After 30 min fluorescence was measured on a Coleman photofluorometer type 12C. Linearity was obtained with samples containing 0 to 100 μg of organophosphate. For both compounds the limit of detectability was 0.2 μg/10 cc. The determination was applied to blood containing Dipterex after activated charcoal treatment. Repeatable results were obtained and the recovery was 83.5 ± 3%.

73-0462. Murano, A.; Doi, T.; Kitahara, H. (Takarazuka Res. Lab., Sumitomo Chem. Co., Ltd., 4-2-1 Takatsukasa, Takarazuka, Hyogo Prefect., Japan). **Gas-liquid chromatographic determination of furamethrin.** *Agr. Biol. Chem. 36(8): 1277-1283; 1972.* (4 references)

A GC method was developed for the determination of furamethrin which gave values equal to those obtained by the TLC-UV method. The most satisfactory operating conditions included a column support of sodium borate-treated Chromosorb W and a liquid phase of 5% silicone XE-60; a flame ionization detector was employed. Baseline drift occurred before the appearance of furamethrin when untreated Chromosorb W was used, suggesting decomposition of the compound. A standard deviation of 0.8% was obtained with either column when adequate internal standard was used. The *cis* and *trans* isomers in technical products containing furamethrin were separated using a 5% silicone DC QF-1 column.

73-0463. Schindler, R. L.; Kruckenberg, S. M. (Anim. Resources Facility, College of Vet. Med., Kansas State Univ., Manhattan, KS 66506). **Changes in cholinesterase activity in stored equine blood samples.** *Amer. J. Vet. Res. 33(9): 1893-1894; 1972.* (4 references)

Alternate freezing and thawing had little effect on ChE activity of equine serum or hemolyzed red blood cell samples, but some activity was lost on storage of serum or red blood cells. Serum stored at -17° for eight and twelve wk retained 87% and 44% of its ChE activity, respectively, while when stored at 4° the retention values were 93% and 50%, respectively. Erythrocyte ChE activity was 75% and 71% of the original in frozen eight and twelve wk samples and 0% after eight weeks of refrigeration.

73-0464. Baba, N.; Kirihata, M.; Takano, T.; Ohno, M. (Lab. of Plant Product Chem., Inst. for Chem. Res., Kyoto Univ., Uji, Kyoto, Japan). **Color reaction of pyrethrins and eugenol with orthophosphoric, sulfuric, and hydrochloric acids.** *Bull. Inst. Chem. Res., Kyoto Univ. 50(3): 150-159; 1972.* (19 references)

Of the nine alkenyl compounds tested for color reaction with orthophosphoric, sulfuric, and hydrochloric acids, all but *cis* and *trans* isoeugenol had similar behavior toward each of the three reagents. A study of the reaction of eugenol with orthophosphoric acid suggested a delocalization by 1,3-interaction or homoconjugation was responsible for the absorption in the visible region. The color development of pyrethrolone was supposed to originate in delocalization by 1,4-interaction of the acrolein and butadiene fragments. Using orthophosphoric acid, a rapid procedure for determining microgram quantities of total pyrethrins in dried pyrethrum flowers was established. Extracts containing 30 to 90 μg of pyrethrins were evaporated to dryness and the residue taken up in 5 ml of a mixture of 85% orthophosphoric acid and ethyl acetate 4:1. After heating the sample for 2.5 min at 100° and cooling it, the absorbance was measured at 550 nm. In an analysis of three random crop samples, values obtained were similar to those obtained by acidimetry.

73-0465. Bogin, E.; Egyed, M. N. (Kimron Vet. Inst., Bet Dagan, Israel). **Biological-biochemical method for the diagnosis of fluoroacetamide poisoning. III. Inhibition of aconitase.** *Fluoride 5(4): 220-225; 1972.* (10 references)

A simple, rapid method for the diagnosis of fluoroacetamide (FAA) poisoning was developed. An aqueous tissue homogenate was boiled, centrifuged, and the supernatant tested for inhibition of aconitase. Fluorocitrate was presumed the aconitase inhibitor. The greatest inhibitory activity in tissue of animals treated with FAA was found in the heart and kidneys. Complete inhibition was obtained with samples taken 2 to 3 hr after administration. The test can be carried out up to 40 hr after death if the kidney is used. Results from this method agree with those of the commonly used, indirect diagnostic procedure.

73-0466. Markina, V. V.; Kamennov, N. A. (All-Union Res. Inst. of Disinfection and Sterilization, Min. of Pub. Health of the USSR, Moscow, USSR). **Metod opredeleniya malykh kolichestv repellentov v biologicheskikh materialakh. [Method for the determination of small repellent quantities in biological materials.]** *Gig. Sanit. 37(5): 66-69; 1972.* (1 reference) (Russian)

A thin-layer chromatographic method is described for the determination of small quantities of diethyltoluamide (deet), benzimine, and carboxide in blood, urine, and in samples wiped off the skin. After the sample is combined with acetone and shaken, it is put on the starting line of the alumina layer together with standard solutions. The plate is dried for 30 min, then solvent systems (19:1 mixture of benzene with methanol

for DETA, 1:1 mixture of heptane with ethylacetate for benzimine, and 2:1 mixture of heptane with ethylacetate for carboxide) are applied. Iodine vapor is used as the chromogenic reagent. The sensitivity is 0.5 μg.

73-0467. Kulikov, V. I.; Botvin'yeva, A. M.; Sidenko, I. N. (Belorussian Pub. Health Res. Inst., Minsk, USSR). **Determination of Eptam (EPTC) and Tillam (pebulate) in food products by gas-liquid chromatography.** *Hyg. Sanit. 36(4): 84-86; 1971.* (2 references)

English translation; for an abstract of the original Russian article, *Gig. Sanit.* 36(4): 70-72; 1971, see Abstract no. 72-0869.

73-0468. Uporova, G. I.; Shtyler, S. Y. (Regional Sanit. and Epidemiol. Cent., Smolensk, USSR). **Experience in the determination of DDT and hexachlorane (BHC) in food products by thin layer chromatography with fluorescein.** *Hyg. Sanit. 36(4): 120-123; 1971.* (1 reference)

English translation; for an abstract of the original Russian Article, *Gig. Sanit.* 36(4): 97-98; 1971, see Abstract no. 72-0870.

73-0469. Dranovskaya, L. M.; Lyalikov, Yu. S.; Filippov, M. P. (Inst. Chem. of Acad. Sci. of Moldavian SSR, Kishinev, USSR). **Spectrophotometric determination of DDT in air.** *Hyg. Sanit. 36(5): 242-243; 1971.*

English translation; for an abstract of the original Russian article, *Gig. Sanit.* 36(5): 59-60; 1971, see Abstract no. 72-0871.

73-0470. Supin, G. S.; Vayntraub, F. P.; Makarova, S. V. (All-Union Res. Inst. of Chem. Means for Protect. Plants, Moscow, USSR). **Oscillopolarographic determination of trace amounts of dinitro-*o*-cresol in water.** *Hyg. Sanit. 36(5): 243-245; 1971.* (5 references)

English translation; for an abstract of the original Russian article, *Gig. Sanit.* 36(5): 61-62; 1971, see Abstract no. 72-0872.

73-0471. Kosmatyi, E. S.; Tret'yak, M. G. (Ukrainian Res. Inst. for Protect. Plants, Kiev, USSR). **Polarographic determination of sayphos (menazon) in water.** *Hyg. Sanit. 36(5): 246-247; 1971.* (1 reference)

English translation; for an abstract of the original Russian article, *Gig. Sanit.* 36(5): 62-63; 1971, see Abstract no. 72-0873.

73-0472. Troshko, E. V.; Debelyi, A. S. (All-Union Res. Inst. of Medicinal Plants, Moscow Region, USSR). **Determination of residual dichloralurea in certain plants.** *Hyg. Sanit. 36(5): 302-304; 1971.*

English translation; for an abstract of the original Russian article, *Gig. Sanit.* 36(5): 105-106; 1971, see Abstract no. 72-0875.

73-0473. Rozin, D. G.; Bekmayeva, A. D. (Andizhan Reg. Sanit. Epidemiol. Cent., Andizhan, USSR). **On applicability of thin layer chromatography to indication of aldrin.** *Hyg. Sanit. 36(5): 305-306; 1971.*

English translation; for an abstract of the original Russian article, *Gig. Sanit.* 36(5): 106-107; 1971, see Abstract no. 72-0874.

73-0474. Vengerskaya, K. Y.; Zelinskaya, O. V. (Uzbek Occup. Health Res. Inst., Tashkent, USSR). **On determination of Milbex in environmental objects.** *Hyg. Sanit. 36(6): 410-412; 1971* (2 references)

English translation; for an abstract of the original Russian article, *Gig. Sanit.* 36(6): 64-65; 1971, see Abstract no. 72-1097.

73-0475. Hutzinger, O.; Jamieson, W. D.; Safe, S. (Atlantic Reg. Lab., Nat. Res. Council of Canada, Halifax, Nova Scotia, Canada). **Mass spectra of some fungicidal organomercury compounds.** *Int. J. Environ. Anal. Chem. 1(2): 85-97; 1971.* (26 references)

Mass spectra of diphenyl mercury, phenylmercuric acetate, phenylmercuric propionate, phenylmercury chloride, methoxyethylmercuric chloride, ethoxyethylmercuric chloride, methylmercuric acetate, methylmercuric dicyandiamide, phenylmercuric salicylate, and ethylmercurithiosalicylic acid were obtained. Their major fragmentation pathways are discussed. The mass spectrometry of mercurials has the advantage of unambiguously identifying small samples directly or after only simple clean-up procedures. The method was applied to determinations in wheat and barley treated with methylmercury dicyandiamide.

73-0476. Frei, R. W.; Mallet, V. (Dept. of Chem., Dalhousie Univ., Halifax, Nova Scotia, Canada). **Quantitative thin-layer chromatography of organothiophosphorus pesticides by in situ fluorimetry.** *Int. J. Environ. Anal. Chem. 1(2): 99-111; 1971.* (26 references)

Organothiophosphorus pesticides were assayed using separation on silica gel N layers followed by fluorimetry. Chromatographic separation utilized a 5:1 mixture of *n*-hexane-acetone as carrier. After removal from the chamber, plates were dried, exposed for 10 sec to 10% bromine in methylene chloride while still hot, and then sprayed with a 1:1 mixture of manganese solution and 0.05% salicyl-2-aldehyde-2-quinolylhydrazone. Spectra were recorded on an Aminco-Bowman Spectrophotofluorometer with a TLC attachment. Quantitative

work employed the Zeiss Chromatogram-Spectrophotometer. Visual detection limits for methyl trithion (methyl carbophenothion), dyfonate, azinphosmethyl, parathion, and diazinon suggest that the amount of fluorescence depends on the number and oxidation state of sulfur atoms present. Detection limits ranged from 0.02 to 0.08 μg/spot and a relative S.D. of 2.4% was obtained with 1 μg samples. Curves were linear up to 6μg/spot. Analysis of tap water for azinphosmethyl gave recoveries ranging from 80% at 0.5 ppb to 92% at 100 ppb and results were confirmed by GC analysis.

73-0477. MacNeil, J. D.; Frei, R. W.; Hutzinger, O. (Dalhousie Univ., Halifax, Nova Scotia, Canada). **Electron donor-acceptor complexing reagents for the detection of pesticides on TLC. II. Carbamates, anilides, and ureas. Spray reagents, chromatography, and instrumental techniques.** *Int. J. Environ. Anal. Chem. 1(3): 205-220; 1972.* (14 references)

A sensitive, nondestructive, rather selective technique was established for carbamate and urea residues. MS and reflectance spectroscopy can be used additionally to identify and analyze the pesticide. The pesticides were chosen for their potential ability as electron donors. Eastman chromatogram silica-gel sheets 6061 and Eastman chromatogram cellulose sheets 6064 were used to separate the materials. Separations were better on silica gel, but both were satisfactory and no difference in color was obtained on either sheet. Spray reagents were, in order of efficiency as electron acceptors: CNTNF (9-di-cyanomethylene-2,4,7-trinitrofluorene) > CNTetNF (9-dicyanomethylene-2,4,5,7-tetranitrofluorene) > TNF (2,4,7-trinitro-9-fluorene) > TetNF (2,4,5,7-tetranitro-9-fluorene) > DDQ (2,3-dichloro-5,6-(dicyano-1-4-benzoquinone) > TCQN (7,7,8,8-tetracyanoquinodimethane) > TCNE (tetracyanoethylene). From 0.5 to 5.0 μg could be detected depending on the strength of the complex formed. The method should be of particular use in the study of carbamate and urea pesticide metabolism.

73-0478. Zitko, V. (Fisheries Res. Board of Canada, Biological Station, St. Andrews, New Brunswick, Canada). **Problems in the determination of polychlorinated biphenyls.** *Int. J. Environ. Anal. Chem. 1(3): 221-231; 1972.* (24 references)

Hexanes containing different amounts of aromatic hydrocarbons affect the elution of polychlorinated biphenyls (PCBs) from silica columns. To achieve reliable separation from organochlorine pesticides the activity of adsorbents has to be carefully controlled and the solvents characterized by UV spectra or other means. Several batches of silica were contaminated with up to 0.26 μg/g PCBs resembling Aroclor 1254. Chlorinated naphthalenes accompany PCBs in silica chromatography; if present in concentrations above 3μg/ml, they can be determined by UV spectrophotometry. An appropriate detection method should be developed for chlorinated terphenyls and halogenated biphenyls other than PCBs which occur in environmental samples. PCBs cannot be accurately measured in the environment since PCB components are not fully identified, but reasonably precise measurements can be made. PCB levels in fish samples calculated by the peak-height method and the peak-area method agreed well enough although the peak-height method yielded higher results. Samples of American eel, herring, and Atlantic salmon from Nova Scotia and New Brunswick contained 0.3-0.7 ppm PCB, 0.1-0.6 ppm *p,p'*-DDE, 0.02-0.3 ppm *p,p'*-DDD (TDE), and 0.1-0.3 ppm *p,p'*-DDT. Commercial fish oil contained 3.5 ppm PCB, 2.3 ppm *p,p'*-DDE, and 0.4 ppm *p,p'*-DDT.

73-0479. Rappe, C.; Nilsson, C. (Dept. of Organic Chem., Univ. of Umea, S-90187 Umea, Sweden). **An artifact in the gas chromatographic determination of impurities in pentachlorophenol.** *J. Chromatogr. 67(2): 247-253; 1972.* (7 references)

Commercial samples of pentachlorophenol were analyzed by gas chromatography and mass spectrometry. The main impurity of higher molecular weight was found to be 3,4,5,6-tetrachloro-2-(2,3,4,5,6-pentachlorophenoxy)phenol. During gas chromatographic analysis this compound was found to undergo ring closure to give 1,2,3,4,6,7,8,9-octachlorodibenzo-*p*-dioxin, which may also be an impurity in the commercial samples. Other impurities found were two isomeric octachlorophenoxyphenols of unknown structure. (Author abstract by permission)

73-0480. Kawano, Y.; Bevenue, A. (Dept. of Agr. Biochem., Univ. of Hawaii, Honolulu, HI 96822). **Analytical studies of pyrethrin formulations by gas chromatography. II. Isolation of the pyrethrins from water-based formulations.** *J. Chromatogr. 72(1): 51-59; 1972.* (6 references)

The extraction of pyrethrins and synergists from water-base aerosol formulations is improved and simplified by the use of acetone in the extraction procedure. The procedure minimizes interferences from extraneous substances previously encountered in the subsequent analysis of the pyrethrins by gas chromatography. (Author abstract by permission)

73-0481. Giam, C. S.; Wong, M. K. (Dept. of Chem., Texas A & M Univ., College Station, TX 77843). **Problems of background contamination in the analysis of open ocean biota for chlorinated hydrocarbons.** *J. Chromatogr. 72(2): 283-292; 1972.* (8 references)

Contamination from chemicals, materials, and equipment used in the analysis of open ocean samples for chlorinated hydrocarbons in the parts per billion range is a serious problem. Where applicable, heating the materials, equipment, and chemicals at 300-350° over-

night was effective in removing the contaminants responding to the electron capture detector. With this and other precautions, background contamination can be reduced to an extremely low level which permits more accurate determination of the chlorinated hydrocarbons in open ocean samples. (Author abstract by permission)

73-0482. Geike, F. (Biologische Bundesanstalt fuer Land- und Forstwirtschaft, Inst. fuer Pflanzenschutzmittelforschung, Berlin, Germany). **The utilization of the inhibition of some enzymes by phenoxyalkanecarboxylic acid herbicides for their thin-layer chromatographic-enzymatic identification.** *J. Chromatogr. 72(2): 333-342; 1972.* (33 references) (German)

The thin-layer chromatographic-enzymatic inhibition technique using bovine liver esterase, alkaline and acid phosphatase, trypsin, α- and β-amylase, and urease is studied for the detection of phenoxyalkanecarboxylic acid herbicides. With the exception of amylases, which are only weakly inhibited or not inhibited, all of the above-mentioned enzymes can be used for herbicide detection. Of all the enzymes studied, detection by inhibition of the acid phosphatase is most sensitive. In general, irradiation of the herbicides with UV light does not have much influence on the detection limits. (Author abstract by permission)

73-0483. Von Stryk, F. G. (Canada Dept. of Agr., Research Sta., Harrow, Ont., Canada). **Separation and determination of some systemic fungicides and their metabolites by thin-layer chromatography.** *J. Chromatogr. 72(2): 410-412; 1972.* (11 references)

Benomyl, thiophanate-methyl, and thiophanate are broad-spectrum systemic fungicides. All three appear to be metabolized in plant tissue to 2-benzimidazolecarbamic acid methyl ester (MBC). A thin-layer chromatographic method was developed for the separation and determination of the three fungicides, as well as MBC with benzimidazole and 2-aminobenzimidazole, the latter two resulting from loss of the carbamic acid ester group from MBC. Commercial thin-layer chromatography sheets coated with silica gel and containing a fluorescent indicator were used in a two-dimensional technique with benzene-methanol (9:1) and ethyl acetate-chloroform (6:4) as the solvent systems. A 0.5% solution of *N*-2,6-trichloro-*p*-benzoquinoneimine, previously used for the detection of carbamates, was a sensitive chromogenic spray reagent for the detection of MBC. Unsprayed, the compounds appeared under UV light as distinct dark spots on a pink fluorescent background. With the spray reagent, MBC appeared as an intensely blue colored spot which faded after several minutes. The other compounds did not give this reaction. As little as 25 ng of MBC can be detected by this method.

73-0484. Seiber, J. N.; Crosby, D. G.; Fouda, H.; Soderquist, C. J. (Dept. of Environ. Toxicol., Univ. of California, Davis, CA 95616). **Ether derivatives for the determination of phenols and phenol-generating pesticides by electron capture gas chromatography.** *J. Chromatogr. 73(1): 89-97; 1972.* (20 references)

The formation of ether derivatives for the gas chromatographic determination of phenols and phenol-generating pesticides provides a simple and sensitive analytical method. The properties of a series of 2,6-dinitro-4-trifluoromethylphenyl ethers were compared with those of previously reported pentafluorobenzyl and 2,4-dinitrophenyl derivatives of phenols; the three types were found to be similar in their ease of preparation, stability, and electron capture response, and formed a complementary series for trace analysis and identification. Micro-derivatization may be applied to phenols, pesticides which generate phenols on hydrolysis, or both; for illustration, recovery of ppb levels of carbaryl insecticide and the corresponding 1-naphthol from water via the DNT derivative exceeded eighty percent. (Author abstract by permission)

73-0485. Aue, W. A.; Kapila, S.; Hastings, C. R. (Dept. of Agr. Chem., Univ. of Missouri, Columbia, MO 65201). **The use of support-bonded silicones for the extraction of organochlorines of interest from water.** *J. Chromatogr. 73(1): 99-104; 1972.* (21 references)

Water was spiked with various types of chlorinated organics at trace levels in an effort to demonstrate the potential of support-bonded silicones to collect these pollutants from natural aqueous systems. Greater amounts of the spiked water were pumped through a bed of a silicone phase, followed by a small amount of pentane. The pentane eluted the collected organochlorines, ready for determination by electron capture gas chromatography. This approach proved successful for most model compounds at parts per trillion levels. (Author abstract by permission)

73-0486. Leitch, R. E. (E. I. du Pont de Nemours & Co., Inc., Industrial and Biochemicals Dept., Experimental Station, Wilmington, DE 19898). **Precise quantitative analysis with a stable, high-speed liquid-liquid chromatography column.** *J. Chromatogr. Sci. 9(9): 531-535; 1971.* (11 references)

A liquid-liquid chromatographic method for the determination of methomyl was carried out for more than 12 mo to assess the usefulness of conservation measures in maintaining the performance of the columns. A prototype of the Du Pont Model 820 LC equipped with a 254 nm UV detector was employed. Benzanilide was used as an internal standard and peak areas were integrated electronically. The column consisted of Zipax (20 to 37 μ) controlled surface porosity support coated with 3,3-oxydipropionitrile (ODPN). Measures taken to preserve performance included

thorough saturation of the mobile liquid and sample solutions with ODPN; sparging of the mobile liquid with nitrogen prior to saturation; and using a pre-column heater when necessary. Column efficiency remained constant within reasonable limits throughout the test period.

73-0487. Makarova, S. V.; Bel'skaya, G. F.; Soboleva, D. A. (All-Union Res. Inst. of Chem. Plant Protect., Moscow, USSR). **Aniliz ftalofosa i benzofosfata iodometricheskim metodom. [Analysis of phthalophos and benzophosphate by means of iodometric titration.]** *Khim. Sel. Khoz. 10(5): 361-362; 1972.* (6 references) (Russian)

An iodometric method is described for the determination of phthalophos (Imidan) and of benzophosphate (phosalone). The method is based on the iodometric titration of dithiophosphoric acids formed during alkaline hydrolysis. The sample is combined with ethylene and an aqueous solution of sodium hydroxide; after neutralization with 0.5 *N* hydrochloric acid more acid is added. Titration is done with 0.025 *N* iodine solution added every 2-3 min. The root-mean-square error of the determination is 0.38.

73-0488. Romina, L. I. (All-Union Res. Inst. of Dairy Production, Moscow, USSR). **Opredeleniye soderzhaniya trikhlormetafosa-3 v moloke razlichnymi metodami. [Determination of trichlorometaphos-3 residues in milk by various methods.]** *Khim. Sel. Khoz. 10(6): 443-444; 1972.* (3 references) (Russian)

Trichlorometaphos-3 (ronnel) residues in milk samples from cows previously sprayed with this insecticide were determined by three different methods, detailed elsewhere. The values obtained by colorimetry using the reaction of the 2,4,5-trichlorophenol formed during alkaline hydrolysis of trichlorometaphos-3 with 4-aminoantipyrine, measurement of the milk cholinesterase activity, and a radiometric method using ^{32}P-labeled trichlorometaphos-3 were compared. While the variations in the residue contents as determined by the colorimetric method paralleled the cholinesterase activity values obtained, the first-named method proved to be the most specific and accurate of the three techniques. The determination of the cholinesterase activity constitutes merely a qualitative method, and the radiometric method detects phosphorus contained in both trichlorometaphos-3 and its metabolites.

73-0489. Visweswariah, K.; Majumder, S. K.; Jayaram, M. (Central Food Technol. Res. Inst., Mysore-2A, India). **Field test for the detection and semiquantitative estimation of captan (*N*-trichloromethylthio-tetrahydrophthalimide).** *Microchem. J. 17(4): 396-402; 1972.* (13 references)

A quick, convenient method for semiquantitative estimation of captan which depends on hydrolysis with monoethanolamine for 10 min at boiling temperature was developed. Color observed ranged from very faint yellow with 0.1 to 0.5 mg of captan to blood red with 5.0 mg or more. Characteristic color changes, as well as the presence or absence of a precipitate, were used to estimate captan in the presence of DDT, new-BHC-isomer, BHC, aldrin, malathion, and thiram. Confirmation of the estimation was obtained using chromogenic agents such as silver nitrate and ferric alum solutions.

73-0490. Yamaoka, T.; Tsujino, Y. (Author address not given). **Determination of thiometon residues in cucumber and peach fruits.** *Sankyo Kenkyusho Nenpo (Ann. Rep. Sankyo Res. Lab.) 23: 220-224; 1971.* (2 references)

Residues of thiometon were determined in cucumber and peach fruits using a GC technique. An acetone extract of the fruit was chromatographed on an alumina column. The eluate was evaporated to dryness and the residue was taken up in a standard solution of ethylthiometon and injected onto a GC equipped with a phosphorus-sensing flame photometric detector. Recoveries of thiometon at levels between 0.08 and 0.2 ppm were 83 to 97% and 90 to 99% for cucumbers and peaches, respectively. Residues in fruit samples collected from two different agricultural experimental stations were found to be less than 0.002 ppm.

73-0491. Gorbacheva, N. A. (Sci. Res. Inst. of Forensic Med., Min. of Pub. Health of the USSR, Moscow, USSR). **Ispol'zovaniye nekotorykh sorbentov pri sudebno-khimicheskikh issledovaniyakh metiletiltiofosa, Soobshcheniye 2. [Employment of certain sorbents in forensic chemical analysis of methyl ethyl thiofos. Report 2.]** *Sud. Med. Ekspertiza 14: 36-40; 1971.* (Russian)

Different column sorbents such as aluminum oxide (non-activated, with 5th degree of activity and activated at 550°C), hydrated magnesium oxide and polyamide powder, and eluants with different polarities were investigated for use in forensic chemical analysis of methyl ethyl thiofos (methyl ethyl parathion), *p*-nitrophenol, and OP-7 (a formulation surfactant). The best results for simultaneous elution of methyl ethyl thiofos, *p*-nitrophenol, and OP-7 on non-activated acid aluminum oxide are achieved with acetone, ethyl ether, chloroform, and dichloroethane while methanol is best for aluminum oxide with 5th degree of activity. Acetonitrile, alcohols, acetone, ethyl ether, chloroform, dichloroethane, benzene or toluene are the best eluants for methyl ethyl thiofos on hydrated magnesia sorbent, and acetonitrile, methanol, or ethanol should be used for *p*-nitrophenol. The sorption of OP-7 on hydrated magnesia from polar solvents is not satisfactory. Polyamide powder consti-

tutes a poor sorbent for methyl ethyl thiofos, but the latter, and also OP-7, are eluted very well by all eluants investigated. Acetonitrile, dichloroethane, benzene, or toluene should be used for the elution of *p*-nitrophenol. Acetonitrile or toluene are best for the simultaneous elution of methyl ethyl thiofos, *p*-nitrophenol, and OP-7 on polyamide powder. Combinations of different sorbents are advantageous in many cases.

73-0492. Fay, R. R.; Newland, L. W. (Dept. of Biol., Texas Christian Univ., Ft. Worth, TX 76129). **Elution of some organochlorine insecticide mixtures by Florisil column chromatography.** *Tex. J. Sci. 24(2): 191-196; 1972.* (12 references)

Column chromatography using Florisil as the adsorbent was employed to clean up and pre-separate mixtures of organochlorines prior to GC analysis. Heptachlor, aldrin, lindane, and *p,p'*-DDT were eluted with 5% ether in hexane and the insecticides were resolved over short intervals. Dieldrin and endrin, stereoisomers, were eluted with 15% ether in hexane and appeared together. A 60 ml fraction was required to recover all of the endrin and dieldrin. The method simplifies subsequent identification of the insecticides.

73-0493. Nepoklonov, A. A.; Metelitsa, V. K. (All-Union Res. Inst. of Veterinary Sanitation, Moscow, USSR). **Opredeleniye amidofosa v moloke i myase metodom tonkosloynoy khromatografii. [Determination of Amidophos in milk and meat by thin-layer chromatography.]** *Veterinariya (Moscow) 48(5): 100-101; 1972.* (Russian)

A thin-layer chromatographic method for the determination of Amidophos residues in milk and meat, and experiments concerning the excretion of Amidophos by animals are described. Chromatographic separation on a thin-layer of an alumina-gypsum or silica gel-gypsum mixture is followed by alkaline hydrolysis and detection with diazotized *p*-nitroaniline. Mixtures of acetone with petroleum ether or with *n*-hexane are used as solvents. Quantitation comprises visual comparison with a standard series containing 1, 5, 10, and 20 mg of Amidophos in 0.1 ml of acetone. As little as 3 μg can be detected. Determinations of Amidophos residues in urine, feces, and organs of rabbits fed a dose of 200 mg/kg showed excretion of the total quantity in about 15 days. Urine and feces contained 1.25-4.5 mg of Amidophos per kg for five days after which mainly a variety of metabolites was detected. The residue contents in tissues and organs were less than 0.5 mg/kg. The rate of excretion was higher in the case of oral administration than in the case of application to the skin. Milk from cows sprayed with 2 l. of a 0.5% Amidophos solution had maximum residue levels during the first 1-3 hours after administration, and full elimination from the milk took 15 days.

73-0494. Adeyshvili, L. G.; Klisenko, M. A. (Georgian Research Inst. of Plant Protection, Tiflis, USSR). **Opredeleniye ostatochnykh kolichestv Fosfamida i Antio v tsitrusovykh kul'turakh metodom khromatografii v tonkom sloye. [Determination of Phosphamide and Antio residues in citrus fruits by means of thin-layer chromatography.]** *Vop. Pitan. 30(3): 84-87; 1971.* (3 references) (Russian)

A method for the identification and determination of Phosphamide (dimethoate) and Antio (formothion) residues in citrus fruits is described. The extract obtained with a mixture of water and chloroform is dehydrated with anhydrous sodium sulfate and the residue sublimated under vacuum. The condensed vapors are removed from the cooler surface with ether. The optimum sublimation conditions necessary to reach recovery rates of 80-100% are a temperature of 60-80°C for Phosphamide and 60°C for Antio and a pressure of 5 mm Hg. An acetone-benzene mixture (2:3) is used as solvent for the thin-layer chromatographic determination on silica gel or aluminum oxide. Bromophenol, palladium chloride, thymol, or diazotized sulfanilic acid can be used as chromogenic reagents. As little as 5-10 μg of the compounds can be detected.

73-0495. Mel'tser, F. R.; Novikova, K. F. (All-Union Research Inst. of Chemical Plant Protection, Moscow, USSR). **Modifikatsiya kolorimetricheskogo metoda opredeleniya benzofosfata v rastitel'nykh ob yektakh. [Modified colorimetric method for the determination of benzophosphate (phosalone) in plant samples.]** *Vop. Pitan. 31(2): 94-95; 1972.* (3 references) (Russian)

A modified spectrophotometric method is described for the determination of phosalone in plant and fruit samples using vacuum sublimation of the extract. Phosalone is extracted with acetone; chloroform is used to extract phosalone from the filtrate to which water was added. The concentrated residue, obtained by evaporation and treatment with anhydrous sodium sulfate, is mixed with acetone and placed in the sublimator where sublimation takes place at 80-90°C and a pressure of 0.2-0.5 mm Hg for 30 min. Phosalone is determined spectrophotometrically at 490 in the form of diazotized 5-chloro-2-aminophenol formed by a reaction of phosalone with resorcinol. As little as 0.1 mg/kg can be detected. Other pesticides do not interfere with the determination.

73-0496. Kontek, . .; Paradowski, S. (Klinika Kardiologii Instytutu Chorob Wewnetrznych AM, Poznan, Poland). **Wartosc diagnostyczna oznaczania aktywnosci cholinesterazy w surowicy testem "Biophan C." [Diagnostic value of serum cholinesterase activity determination by means of the "Biophan C" test.]** *Wiad. Lek. 25(10): 877-881; 1972.* (13 references) (Polish)

Analysis

The "Biophan C" cholinesterase method employs a commercial test kit of East German manufacture, similar to the "Acholest" kit. The Biophan C test and the customary acidimetric method were used to determine the serum cholinesterase activity (pseudocholinesterase, SChE) in 50 patients treated at the cardiology clinic and in 15 agricultural workers exposed to organophosphate pesticides. Out of 50 patients the SChE activity was within normal limits in 35, slightly depressed in 10, and elevated in 5 by the Biophan C test as compared to 37, 7, and 6 respectively by the acidimetric (Δph/hr) method. Among the agricultural workers after three weeks of occupational exposure, the SChE activity was depressed in 12 out of 15; 10 days after discontinuation of work with pesticides, a slight increase in SChE activity was noted in most of the 12 workers. The results indicated a good correlation between the two methods. The use of Biophan C test as a rapid and simple screening procedure for workers exposed to organophosphate compounds is strongly recommended.

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